

Securing Montgomery County's Economic Future through Enhanced Mobility

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Securing Montgomery County's Economic Future through Enhanced Mobility

Executive Summary

- Introduction

Over the next 20 years, Montgomery County will face a problem many counties would love to have – the estimated increase of more than 160,000 jobs. Of course, this merely represents estimated job growth, but one could reasonably ask whether a county that is already heavily gridlocked has the wherewithal to absorb a 36 percent increase in employment. It is unlikely that the county could accommodate the forecasted jobs and associated families without a substantial upgrade in transit capacity and relevance.

This report focuses primarily upon the potential economic benefits of a rapid transit vehicle system now being contemplated in Montgomery County. The system would ultimately include approximately 140 station locations along 140 route miles and would bind the county together. The system would primarily serve Montgomery County residents, would unlock potential planned investment currently delayed by traffic gridlock, and would encourage smart growth. This study is not, however a benefit-cost analysis since a separate study is focused upon the capital and operating costs associated with such a system. What this study provides is an estimation of the level of economic activity that would be unleashed through enhanced mobility and associated residential and commercial development.

- Employment and public transit

Employment projections for the region are striking. According to a Center for Regional Analysis (CRA) analysis and the Metropolitan Washington Council of Governments (MWCOC), by 2030, the region will see 1 million or more net new jobs, an increase of over 38 percent from estimated employment in 2010. Of this total, more than 160,000 net new jobs are projected in Montgomery County alone. Based on these estimates, Montgomery County will represent a 15-percent share of regional employment growth. Over the 20-year period, job growth will lead to an increase of 34.5 percent from current levels of employment in Montgomery County.

This expansion of the employment base from 2010 to 2030 will coincide with the retirement of 200,000 baby boomers, most of whom will stay in the area. The 200,000 replacement workers the county will need over the next 20 years will also add to the demands for housing and other development and will also place new demands on the transportation system.

Public transit is a growing part of that transportation system. Growth in employment over the past 20 years has coincided with an even larger increase in the use of public transit. Residents' use of public transit in Montgomery County has grown 42 percent in recent years with more than 77,000 County residents routinely using public transit in 2010, almost 20,000 more than in 2000 after modest growth in the 1990s.

Exhibit ES1. Trends in use of public transit, 1990-2010

<i>Jurisdiction/Category</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>	<i>New riders 1990-2010</i>	<i>Change 1990-2010</i>
Montgomery County					
Residents using public transit	54,251	57,528	77,112	22,861	42%
Transit users as share of jobs	14%	13%	18%		
Source. U.S. Census					

- Current planning for housing and development

Master plans for planning districts within Montgomery County provide another perspective on the relationship between transit and development. A review of 10 master plans, commercial market analyses, sectors plans, and similar documents found an almost universal identification of transit as a critical element in overcoming local congestion and in facilitating planned growth potential through increased mobility. A number make specific reference to mass transit systems and its ability to facilitate the development process. In other words, many of Montgomery County's most transformative planned and approved commercial and residential real estate investments simply cannot move ahead without additional transit capacity (e.g., White Flint, Shady Grove, Great Seneca). An RTV system would deliver that capacity.

- Economic benefits

In 2010, each job in the county is associated with \$146,000 of economic activity and each new household is linked to \$219,000 of activity (contribution to gross county product). Based on the potential ridership of an RTV-system and its ability to link county residents with county jobs, the RTV system could facilitate and enable as much as \$26 billion dollars of economic activity by 2030. These RTV-dependent jobs and residents and the RTV system can create a range of benefits including new income and residential and commercial property values linked to new workers who live in the County, as shown in Exhibit ES2.

Exhibit ES2. Economic impacts of RTV-dependent, net new workers and households, 2030
(values in millions of 2010 dollars)

<i>Factor</i>	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint estimate</i>
Net new jobs	89,604	132,391	110,998
Gross county product/year	\$17,544	\$25,921	\$21,732
Number of households	59,736	88,261	73,998
Household income/year	\$4,254	\$8,220	\$6,237
Housing value	\$17,015	\$32,881	\$24,948
Commercial property value	\$6,808	\$10,059	\$8,434
Personal property value	\$832	\$1,229	\$1,030
Sources. CRA, Maryland Department of Assessment and Taxation, Sage			

The RTV system itself will increase activity near its stations and along its routes. This increased activity will tend to increase the value of existing nearby properties by as much as \$5 billion.

- Congestion and growth

The Washington, D.C. region, including the Montgomery County, is already the most congested in the country. Each year the average vehicle-based commuter wastes 74 hours and 37 gallons of fuel because of congestion. The forecast of net new jobs will only add to this congestion. In the absence of a substantial increase in transit capacity, the County will be unable to accommodate already planned and approved growth or the additional jobs, growth, and other economic benefits that will accompany the expanding employment base.

Alternatively, an RTV system coupled with more intense development tied to this system can accommodate net new jobs and the housing and other development that is associated with new workers and new households. The RTV system can mitigate congestion associated with this growth by providing a countywide RTV mass transit alternative to automobiles.

Given the projected ridership of the RTV system, the estimate of the total annual avoided costs of congestion ranges from \$163 million to \$241 million. If RTV-based commutes replace typical auto-based commutes in the region, the higher range of values is more accurate. If RTV-based commutes replace shorter, less time consuming commutes, which may be consistent with the intra-county nature of the RTV-based commutes, then the lower range of savings is likely more accurate.

Exhibit ES3. Estimated total annual value of avoided congestion for all RTV passengers
(millions of 2010 dollars)

	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint estimate</i>
Annual RTV ridership	89,604	132,391	110,998
Total congestion cost avoided	\$163	\$241	\$202

- Public policy implications

From a public policy perspective, Montgomery County could embrace both the expected population and job growth, creating potentially shorter commutes in the process. The county could also embrace jobs, but not housing with the implication being that many of the new jobs would be filled by nonresidents, often traveling long distances. The county could also accommodate the population, but not make the infrastructure investments necessary to support commercial development. This would require many of the new residents to secure employment outside of the county, also leading to lengthy commutes as well as foregone commercial tax base. A final possibility is to try to prevent both residential and commercial development, which would cause the county to age over time as population stagnated and as other communities steadily attracted a higher share of the region's net new jobs. This would shrink tax base at least in real terms over time.

The implication of this discussion is that the best public policy outcome emerges from a strategy that seeks to intelligently accommodate both commercial and residential development. In the absence of significant transit improvements, however accommodating this growth intelligently or at all will be difficult.

Securing Montgomery County's Economic Future through Enhanced Mobility

1.0 Introduction

This Sage Policy Group (Sage) report for the Economic Work Group of the Montgomery County Transit Task Force provides an initial assessment of the potential economic and fiscal consequences of developing a countywide transit system. This proposed addition to the county's overall transportation network, known as a rapid transit vehicle (RTV) system, would encompass approximately 140 miles of routes and 140 rapid transit stations. It is envisioned that the system will be similar to light rail in function and appearance, but will use rubber-tire vehicles.

Wherever possible, fully dedicated, segregated, curbed, dual right-of-way platforms located in the median of existing or new roadways will be provided. A feasibility study of the proposed RTV system estimated that utilization would roughly range from 210,000 to 270,000 daily riders with a resulting increase of two percentage points in overall peak-hour transit use in the county.¹

The proposed RTV system would operate similarly to a light rail system. System vehicles would resemble light rail vehicles. Stations would offer a range of passenger amenities including real-time information, security features, and platforms at the same level as the floor of the RTV vehicles. On- and off-board fare collection would facilitate vehicle egress and minimize waiting times at stations. To the extent possible, vehicles would operate in exclusive lanes and, when in mixed traffic, would benefit from several operating conditions that would increase vehicle speeds (e.g., queue jumping, transit signal prioritization). Operations assume frequent service with stations spaced at intervals of one-half to one mile. Stations would also provide high-levels of connectivity to other transit (e.g., Metrorail, local buses) and to bicycle and pedestrian traffic.

From an economic perspective, a critical feature of the proposed RTV system is its links to land use, particularly planned development that is conducive to pedestrian activity. RTV routes are designed to operate along existing corridors of concentrated development and to enable more intense levels of development in master planned growth areas. Indeed there is a symbiotic relationship between the RTV system and concentrated development. Such development creates the levels of activity and numbers of people that make the RTV system operate at higher levels of effectiveness, while the RTV system provides the populations that live and work in these more concentrated developments with efficient mobility at reasonable prices.

Of course, transit is only one transportation option. The predominant choice of residents in Montgomery County, as it is almost everywhere else, is private vehicles, usually occupied only

¹ The proposed RTV system is in a relatively early stage of development and is thus subject to some uncertainties as to its final configuration, capacity, costs, etc. Nevertheless, the system is sufficiently well understood to support the analysis conducted for this report. Where there are uncertainties, this report will identify them.

by the driver. According to the U.S. Census, about four of five county commuters in recent years used private vehicles with about 70 percent of commuters driving alone.

- **The costs of congestion**

This propensity for using private vehicles coupled with the limits of the existing transportation system has earned the Washington, D.C. region the dubious distinction of being the most congested region in the country. Each year the average commuter in the Washington, D.C. region endures 74 hours of delay and wastes 37 gallons of fuel (both the highest values in the nation). On average, travel time during peak periods is one-third longer than when traffic is free-flowing (only Los Angeles has a higher ratio of peak-to-free-flow travel times). The annual cost per Washington area commuter for these delays and wasted fuel is estimated at \$1,495 (second only to Chicago's \$1,568).²

Texas Transportation Institute (TTI) studies of congestion present a mixed view of the future. For the country as a whole, a somewhat downward trend in population and employment growth - "two primary factors in rush hour travel demand" -- will relieve some pressures on congestion. On the other hand, the national cost of congestion is expected to grow from \$101 billion in 2010 to \$133 billion in 2015 and \$175 billion in 2020 in constant 2010 dollars.

Public transit saves both time and fuel. In the absence of this option, congestion costs in 2010 would have increased by \$17 billion.

For the Washington, D.C. region, the TTI report offers mostly bad news, but some glimmers of hope. Unlike the nation as a whole, the Washington, D.C. region's job and population growth in the next two decades will be dramatic, placing significant new demands on the region's transportation system. Since 1982, the Washington, D.C. region has exceeded all other large metropolitan areas in the increase in yearly hours of delay per auto commuter, increasing from 20 hours in 1982 to 74 hours in 2010. Overall demand for transportation has also exceeded roadway growth by more than 30 percent. On the other hand, the region ranked third among major urban regions in the total relief provided by public transportation, behind New York City and Chicago, much larger regions with more extensive transit, but ahead of Los Angeles, Boston, San Francisco, and Philadelphia. Public transportation saved Washington area residents 36 million hours of travel time with a value of \$726 million.

As will be discussed at length in this report, Montgomery County has planned for and indeed will be facing the prospects of a major surge in net new employment over the next two decades. This employment growth will spur demands for housing and commercial development. This potential for growth will occur in the context of some of the most challenging traffic and transportation problems faced by any jurisdiction in the country.

² David Schrank et al, "TTI's 2011 Urban Mobility Report, Powered by INRIX Traffic Data," Texas Transportation Institute, The Texas A&M University System, September 2011 <http://mobility.tamu.edu>

- **Limits on study and analysis**

This report will examine the potential for an RTV system to enable the county to achieve this potential for growth. That is, some share of the potential for new development presumably is only possible if the RTV system or some other alternative to auto-based mobility is available. The RTV system would create a number of benefits for Montgomery County that can translate into economic impacts.

These issues surrounding the potential for development are a subset of the issues that the RTV system and the projection of job growth and its potential demands for development pose for the county. The analysis reported here will then be only a partial discussion of the issues affecting benefits and costs of an RTV system. As possible, when these other issues emerge in the discussion of economic issues, this report will identify them and explain how they affect an overall assessment of an RTV system.

It should also be stressed that the RTV system is in relatively early stages of planning and development. The Transit Task Force is pursuing multiple lines of analysis simultaneously. For example, the capital costs of the system are currently being investigated and an initial estimate of that expense is not available for this analysis. Similarly, the State of Maryland is evaluating alternative technologies for the Corridor Cities Transitway (CCT), a proposed transit service from Shady Grove to Clarksburg, which may be developed as a light rail project or may be integrated into the proposed RTV system. Given this relatively early status of the RTV project, some of the likely economic and fiscal impacts of the project cannot be estimated at this time.

Certain limits on the current analysis include.

- Capital and operating costs of an RTV system. These costs are not available for incorporation into this analysis. Consequently, whatever benefits this analysis estimates cannot be compared to or analyzed in the context of capital or operating costs for the RTV system.
- Potential contributions of State of Maryland or federal agencies to either RTV capital costs or operating costs. Potential financial support by non-County sources is unknown. This analysis concentrates on the potential economic of an RTV system for Montgomery County.
- Phasing and build out of the RTV system versus a fully developed RTV system. Resources and information available for this analysis preclude any informed assessment of a phased development of the system or an assessment of segments of the system. The primary focus of the assessment is the potential status of the county in 2030 when the forecasts for employment and housing growth used in the analysis are fully realized.

- The County's capacity to accommodate potential housing and commercial development. The current MWCOC forecast of employment growth is based on County land use policy and regulations. One option for future development that is enabled by public transit such as the proposed RTV system is concentrated, more intense development, often termed transit-oriented development. This analysis has not investigated whether the County's current zoning policy and planning would or could absorb the potential volumes of development that are possible over the next 20 years to accommodate the forecast employment growth. Similarly, while the analysis has reviewed selected master plans for planning areas within the county, no attempt is made to analyze where new development would be located.
- The nature of future development. As will be discussed below, future development in the county may be different from historic development. One aspect of this difference is the possibility of transit-oriented development, rather than less intense development. Another is the possibility that future residents will have a distinct demographic profile. A detailed projection of future county households finds that new residents will likely be younger and less affluent than existing residents and likely to live in smaller households with fewer children. This has implications for the County that are difficult to estimate, particularly for the cost of services. More intense development may be less expensive to service than more widespread development. Reduced demands for public education will also have significant impacts on costs of service. While logic indicates that new development may incur relatively lower costs for services from the County, a thorough and comprehensive quantifying those reduced costs of services is difficult and beyond the scope of this analysis.

2.0 Toward a Transformation of Montgomery County

As will be demonstrated, the development of an RTV system could well be key to the County's ability to achieve currently planned growth, particularly the expected growth in employment, which will in many ways lead to a transformation of the county. This is driven by the forecasted substantial increase in the county's employment base with its consequent demands for housing and commercial space that are likely to be met by more intense patterns of development. Compounding this expected surge in new jobs will be the retirement of the baby boom generation which will create the need for replacement workers many of whom will seek housing in the county.

The employment forecast of net new jobs for Montgomery County represents a sharp departure from the County's recent job growth experience. In the past decade the county has actually lost jobs. Two forecasts of job growth in the County over the next 20 years reach almost identical conclusions. The "official" forecast included in the most recent cooperative forecast of the Metropolitan Washington Council of Governments (MWCOC) calls for 167,000 additional jobs in the County between 2010 and 2030.³ A recent analysis by George Mason University's Center for Regional Analysis (CRA) estimates that there will be 163,008 net new jobs in the County over that same period.⁴ Going back 20 years, the county added 60,000 jobs and, in fact, added 65,000 jobs from 1990 to 2000. Rapidly expanding employment is certainly not unknown, but is still in obvious contrast to the recent history of job losses.

Increases in the housing stock are also part of the county's history. From 1990 to 2010, more than 80,000 new housing units were created at a rate of about 40,000 units per decade. Housing stock has then expanded in the county regardless of whether county-based employment was growing or shrinking. This may reflect both a tendency among new residents to commute to work outside the county and the need for housing for replacement workers as well as for those who retire and stay in their homes in the county.

The forecasted addition of 160,000 or more jobs will be a major achievement in the development of the county. Creating that many new jobs will mean that by 2030 Montgomery County will

³ "Growth trends to 2040: Cooperative forecasting in the Washington, D.C. region, Round 8.0," Metropolitan Washington Council of Governments, Fall 2010.

⁴ The projected increase in County employment is taken from Lisa A. Sturtevant, PhD, Stephen S. Fuller, PhD, "Housing the Region's Future Workforce: Policy Challenges for Local Jurisdictions, Final Report," George Mason University School of Public Policy, Center for Regional Analysis, Arlington, Virginia, October 25, 2011 (the CRA study).

have an employment base exceeding 635,000 jobs, more than any other jurisdiction in Maryland, and bypassing Baltimore City and Baltimore County over the next 20 years.⁵

These forecasts suggest that, in order for the county to achieve its planned goals for growth, it will need to expand public transit capacity linked to more intensive land use. This growth would presumably focus on those master planned parts of the county that can support more intense development that would be compatible with a more diverse population likely to be drawn by new job opportunities in the county.

If the observations of some experts on planning and development are accurate, such a change may well be timely. According to a recent analysis, in the past decade, the most expensive housing in the country has shifted from "high-end outer suburbs" to "pedestrian-friendly neighborhoods of the center city and inner suburbs." This shift is considered durable and lasting because it involves both baby boomers and their offspring, the millennials, who account for half of the country's population. Both are seen as favoring walkable downtowns or suburban town centers according to a poll by the National Associations of Realtors. That poll found only 12 percent of future homeowners preferred auto-dependent housing on the suburban fringe.⁶ Another analysis argued that the age of the suburban office complex unconnected to housing, civic space, transit, and other infrastructure and completely dependent on the automobile (begun when AT&T moved its Bell Labs from Manhattan to Summit, New Jersey in 1942), had come to an end as the costs of sprawl become increasingly unsustainable.⁷

The types of changes inherent in adding an average of 8,000 jobs annually for 20 years are contemplated by the County's 2009-2011 growth policy. That policy acknowledges that limited developable land and continuing growth pressures will require new ways of imagining the future.

“Examining our current growth pattern brings a new realization. We are almost out of new land to develop. But growth will continue and shifting demographics will demand new types and patterns of development.

How we grow impacts the amount of Vehicle Miles Travelled (VMT). We can address this issue one of two ways. Either by building more capacity, meaning more and wider roads, or we can influence demand through development location and transit service. The first option is not viable nor would it reduce VMT.

⁵ According to the most recent cooperative forecast of the Baltimore Metropolitan Council, from 2010 to 2030, Baltimore City employment will increase from 451,000 to 485,000 while Baltimore County employment will increase from 511,000 to 558,000. Round 7-C forecasts, Baltimore Metropolitan Council, approved July 27, 2010. The CRA forecast estimates that employment in Montgomery County will increase from 472,619 in 2010 to 565,133 in 2020 and to 635,627 in 2030.

⁶ Baby boomers are those born between 1946 and 1964) while millennials are defined as those born between 1979 and 1996. See Christopher B. Leinberger, "The death of the fringe suburb," *The New York Times*, November 26, 2011.

⁷ Louise A. Moxing, "To rethink sprawl, start with offices," *The New York Times*, November 26, 2011.

Instead, encouraging growth in smarter locations with transit can over time, reduce the levels of VMT relative to growth in jobs and residents.”⁸

The smart growth ideas put forth in the County's 2009-2011 growth policy have been implemented in several areas of Northern Virginia with results that may indicate the potential benefits for the County and may also help to reverse a recent downward trend in new construction activity. As shown in Exhibit 1, between fiscal year 2010 and fiscal year 2011 Montgomery County experienced a 33 percent decrease in the value of new construction entering its tax base, while the total real property tax base increased a very modest 0.4 percent necessarily placing limits on funding for schools, police, and other public services because of this constrained overall County tax base. This substantial drop in new construction comes on the heels of several years of declining new construction in the County which experienced a 43 percent reduction in the value of new construction from fiscal year 2007 and fiscal year 2011.

Exhibit 1. Trends in Montgomery County tax base

<i>Fiscal year</i>	<i>New construction added to tax base</i>	<i>Total real property taxable assessment</i>	<i>New construction as share of total tax base</i>	<i>Year-to-year change in tax base</i>	
				<i>New construction</i>	<i>Total real property taxable assessment</i>
2007	\$1,605	\$125,711	1.3%	4.1%	13.7%
2008	\$1,484	\$142,306	1.0%	-7.6%	13.2%
2009	\$1,415	\$158,133	0.9%	-4.6%	11.1%
2010	\$1,381	\$167,097	0.8%	-2.4%	5.7%
2011	\$920	\$167,791	0.5%	-33.4%	0.4%
Change 2007-2011	(\$686)	\$42,080	-57.1%	-42.7%	33.5%

Source: Maryland Department of Taxation and Assessment

During the past year, transit-intensive Arlington County in Northern Virginia experienced a 6.6 percent increase in its expanding tax base, including a 1 percent increase in the new construction component of its tax base, resulting in adequate revenues for public services.⁹

Northern Virginia has planned and executed “smart growth” transit oriented land use plans over the past two decades. Under these plans Arlington County and Fairfax County concentrate high density mixed use development at Metro mass transit stations, while maintaining its low density suburban character in locations surrounding these more intensively developed mixed-use, transit-oriented centers. The Rosslyn, Clarendon, Ballston corridor is a good example of this “smart growth” transit oriented land use planning. Fairfax County is currently building the most advanced and extensive mass transit system in the region as it extends Metro to Dulles Airport.

⁸ "Reducing our footprint: Planning Board draft, 2009-2011 growth policy," Montgomery County Planning Department.

⁹ "County Board Agenda Item Meeting of February 11, 2012," Arlington County, Virginia, January 19, 2012

- **The past as prologue**

These issues of the dynamic interaction of transit, transportation, and development have been studied in Montgomery County at least since the late 1980s. While more recent studies have also addressed the issues of growth and transit, the County's 1989 *Comprehensive Growth Policy Study*, building on advances in transportation modeling and the 1988 *General Plan Assessment Study*, included a quantitative assessment of the county's future that is particularly relevant to this analysis. The study examined a range of alternative future development scenarios for which the key variables were the mix of transportation infrastructure and commuting behaviors and the rate of job and housing growth. The transportation variables ranged from the status quo of reliance on auto-based commuting to adding high-occupancy vehicle (HOV) lanes and promoting carpooling to adding a light rail or bus rapid transit (BRT) network of approximately 65 miles that was interconnected with Metrorail. The five growth alternatives encompassed balances of jobs and housing growth at slow and fast rates and policies that favored job or housing growth with a final option of fast balanced growth combined with a policy of "recentralization" with particularly high concentrations of housing development along transit lines.¹⁰

While the recentralization alternative assumed the most concentrated development, the other non-auto-based options also assumed more concentrated job and/or housing development. Nevertheless, the scenarios based on having light rail/BRT clearly stressed more focused development and included a range of policies that facilitated transit use including pedestrian friendly design of activity centers, discouragement of campus-style office parks, much higher parking charges and reduced parking supply in business districts, equalized commuter subsidies, and taxes and fees that would double the cost of automobile operation.

As will be shown later in this report, the study's most aggressive growth scenario anticipated even more growth than this analysis does. The housing and jobs growth assumptions of the four basic alternatives are listed below. The recentralization alternative used the assumptions of the fast growth alternative, but configured this growth somewhat differently.¹¹

- Fast growth. 900,000 jobs and 600,000 households.
- Slow growth. 600,000 jobs and 400,000 households.
- Jobs-biased growth. 900,000 jobs and 450,000 households.
- Housing-biased growth. 750,000 jobs and 600,000 households.

¹⁰ This discussion of the *Comprehensive Growth Policy Study* is taken from an article by the main author of the study which discusses the application of transportation models to land use planning. See Michael Replogle, "Computer transportation models for land use regulation and master planning in Montgomery County, Maryland." Transportation Research Record 1262

¹¹ Michael Replogle, "Land use/Transportation scenario testing: a tool for the 1990s," Montgomery County Planning Department (M-NCPPC), prepared for the Transportation Research Board 1993 annual meeting.

The results of the *Comprehensive Growth Policy Study* were based on sophisticated transportation modeling. Projecting 30 years into the future (i.e. through 2020), the model found that reliance on the status quo of auto-based transportation was unworkable from transportation and environmental perspectives, regardless of the assumptions made on future growth. The HOV/carpooling alternative was more successful in reducing/maintaining congestion at what was described as "closer to the countywide standard" although this option failed under the pressures of the high job and housing growth scenario. The light rail/BRT option was projected "to closely approach or meet" the County's congestion standards, depending on how land use was allocated. Finally the recentralization option, which used the light rail/BRT option assumptions, but placed even more emphasis on what would now be considered transit-oriented development, was most successful at containing congestion and its related costs.

Under this final option, congestion would fall significantly while per capita energy use, air pollution, and infrastructure costs would be the lowest of any modeled alternative. The *Comprehensive Growth Policy Study* acknowledged that the decisions and policies that were assumed under the recentralization alternative presented fundamental political problems, challenged vested interests, and turned away from standard practice. Nevertheless, the study considered its findings as a way to resolve perennial problems of congestion, government finances, affordable housing, and labor shortages by providing an economically and environmentally sustainable road map (or rather a transit map) to accommodating future growth.

Despite the fact that the *Comprehensive Growth Policy Study* was conducted about 20 years ago, the parallels between that analysis and the issues addressed by the this report are striking. That is, how would a major increase in transit capacity compared to other transportation options affect the county's ability to accommodate substantial increases in jobs and demands for housing over a decades-long period? The conclusion that the most successful response to such demands was a combination of a large transit system and transit-oriented development appears to be highly relevant to the questions being asked by the current Transit Task Force and entirely consistent with the County's current approved master plans and growth policies.

- **RTV as part, but only part, of the solution**

As current Montgomery County growth policy indicates and the 1989 *Comprehensive Growth Policy Study* demonstrated, transit like the proposed RTV system can be a key element in planning for job and housing growth in Montgomery County. Other recent reports have also noted that transit is part of the infrastructure that will be needed to undergird and allow new development in Montgomery County and throughout the Washington, D.C. region.¹²

¹² See Stephen S. Fuller, "The future of the Washington metropolitan area economy: alternative growth scenarios and their regional implications," prepared for The 2030 Group, April 2010

The Washington, D.C. region is expected to almost double the value of its economic output over the next 20 years, one of the fastest growth rates in the country. This growth will place many demands on local government for expanding services and policy changes.

While transit is a necessary part of the response to growth pressures, it is not sufficient in itself as a solution. The most successful alternative modeled in the *Comprehensive Growth Policy Study* buttressed a major expansion of transit capacity with transit-oriented development and other policies that encouraged both more intense development and alternatives to auto-based transportation.

This analysis only addresses the potential impacts of transit, not other key factors that will affect Montgomery County's ability to support the opportunities for development that these growth pressures will create. The specific nature of these other factors necessary to make a successful RTV system that can accommodate substantial growth while maintaining a viable transportation system are well beyond the scope of this analysis, but are a routine part of the County's master planning process. The list of these factors not addressed by this analysis includes the following.

- Land use policy. No attempt was made to determine whether existing zoning allows for the volume of housing and commercial development that economic growth could bring.
- Water and sewer capacity.
- Educational services. These range from pre-K to the continuing education and lifelong learning needs of a continuously evolving workforce trying to meet the demands of a highly dynamic economy.
- Parks, recreation facilities, and other quality of life facilities.
- Growth policy. The County has fundamental control over the rate and extent of development. As the quote from the draft 2009-2011 County growth policy indicates, the County has choices in how it chooses to address the opportunity for growth ranging from embracing and encouraging such growth to deciding that new development must be limited.

These are all major concerns. As noted they are also part of the County's master planning process. They are noted here primarily to clarify what issues this analysis was able to address and what was out of scope. In the event that any of these issues remain concerns, the time horizon for transit development is long, however, and allows for thoughtful consideration of how the County can best respond to the opportunities that remarkable future job growth presents.

3.0 Macro-level perspective on future growth

Growth can be driven by a multitude of factors -- population increases, in-migration, employment growth. Employment is one of the most fundamental of these engines of growth and the Washington, D.C. region is a particularly vivid example of how new jobs can create demand for development.

The Maryland Department of Planning estimates that between 2010 and 2030, Montgomery County's population will increase 17.6 percent, with population over the age of 16 rising a bit faster than that. This estimate presumes that Montgomery County will add the housing necessary to accommodate this net new population. It also presumes a certain level of job growth in and around the county, something displayed in Exhibit 2 and discussed in detail in the section below.

Exhibit 2. Montgomery County population patterns, 2010-2030

	2010	2020	2030	% change over 20 years
Population	980,000	1,065,000	1,152,000	17.6%
Population 16+	767,610	839,270	915,980	19.3%
Labor Force	549,600	582,110	610,050	11.0%
Household Population	967,232	1,049,673	1,131,983	17.0%
Number of Households	360,500	398,000	438,000	17.7%
Household size	2.68	2.64	2.58	-3.7%
Total Personal Income*	\$59,266,736	\$81,052,890	\$95,936,256	61.9%
Income per Capita*	\$60,988	\$76,106	\$83,278	36.6%
% of State per capita Income	138.5	138.1	137.1	-1.0%
* (in 2005 dollars)				
Source: Maryland Department of Planning State Data Center				

From a public policy perspective, Montgomery County could embrace both the expected population and job growth, creating potentially shorter commutes in the process. The county could also embrace jobs, but not housing with the implication being that many of the new jobs would be filled by nonresidents, often traveling long distances. The county could also accommodate the population, but not make the infrastructure investments necessary to support commercial development. This would require many of the new residents to secure employment outside of the county, also leading to lengthy commutes as well as foregone commercial tax base. A final possibility is to try to prevent both residential and commercial development, which would cause the county to age over time as population stagnated and as other communities

steadily attracted a higher share of the region's net new jobs. This would shrink tax base at least in real terms over time.

The implication of this discussion is that the best public policy outcome emerges from a strategy that seeks to intelligently accommodate both commercial and residential development. In the absence of significant transit improvements, however accommodating this growth intelligently or at all will be difficult.

- **Employment projections 2010-2030**

Two relatively recent projections of employment for the region are in basic agreement that the future holds dramatic increases in employment. The MWCOG routinely publishes cooperative forecasts of employment, households, and population based on each jurisdiction's expectations of future growth. As such it constitutes the "official" local government perspective. Between 2010 and 2030, the MWCOG forecast of employment growth exceeds 920,000 jobs for the entire region.¹³

A recent study by the Center for Regional Analysis (CRA) at George Mason University also included forecasts of employment growth over the 2010-2030 period. The CRA study went on to analyze the demands that projected employment will place on the Washington, D.C. region's housing over the next 20 years. The study argues that "[t]he ability to absorb these new workers into the region and to ensure robust regional economic growth depends critically on providing a sufficient amount of housing of the right types and prices and in the right places."¹⁴

The CRA study is particularly useful for this analysis as it includes an analysis of the nature of the new jobs that will be created in the region and its jurisdictions. This analysis includes estimated incomes for workers and households as well as the value and types of housing that the new households formed by these workers will seek. These details are provided for Montgomery County and each of the other major jurisdictions in the region. These added dimensions of analysis, unavailable in the MWCOG forecasts, allow for a much richer understanding of the implications of new employment for Montgomery County. Another advantage of the CRA study is its discussion of the need for workers to replace those who retire or leave the region. Largely because of the retirement of baby boomers over the next 20 years, the need for replacement workers will be substantial and will create other impacts on development. Given the range of issues addressed by CRA, this analysis has relied on the CRA forecast for a basic understanding of likely job growth, turnover of workers in existing jobs, and the potential consequences for development in the County.

¹³ Op. cit., "Growth trends to 2040: Cooperative forecasting in the Washington, D.C. region, Round 8.0"

¹⁴ Lisa A. Sturtevant, PhD, Stephen S. Fuller, PhD, "Housing the Region's Future Workforce: Policy Challenges for Local Jurisdictions, Final Report," George Mason University School of Public Policy, Center for Regional Analysis, Arlington, Virginia, October 25, 2011. <http://cra.gmu.edu/>

Employment projections for the region are striking. According to the CRA analysis, by 2030 over 1 million net new jobs across the region are forecast, an increase of over 38 percent from estimated employment in 2010. Of this total, an estimated 163,008 net new jobs are projected in Montgomery County alone. Based on these estimates, Montgomery County will represent a 15-percent share of regional employment growth. Over the 20-year period, job growth will lead to an increase of 34.5 percent from current levels of employment in Montgomery County. In absolute terms and in terms of its share of the region's job growth, the forecast for Montgomery County is only slightly smaller than the forecast for Fairfax County. Among all jurisdictions included in the Washington, D.C. metropolitan region, Montgomery and Fairfax counties are expected to see the greatest absolute increase in the region's jobs over the next 20 years, accounting for three out of every 10 net new jobs that will be created, although both Washington, D.C. and Loudoun County, Virginia are projected to have increases in employment exceeding 146,000 jobs each. Exhibit 3 compares the job forecasts for Montgomery County to other selected areas within the Washington, D.C. region.

Exhibit 3. Net new jobs, 2010-2030

<i>Jurisdiction</i>	<i>Net new jobs 2010-2030</i>	<i>Change 2010-2030</i>	<i>Share of regional job growth</i>
Montgomery County	163,008	34.5%	15.5%
Suburban Maryland (includes Montgomery County) (1)	316,525	32.9%	30.0%
Fairfax County (2)	168,833	26.7%	16.0%
Northern Virginia (includes Fairfax County) (3)	578,480	54.9%	54.9%
District of Columbia	152,130	20.8%	14.4%
Region-wide (4)	1,053,855	38.2%	100.0%
Notes. 1. Suburban Maryland includes Calvert, Charles, Frederick, Montgomery, and Prince George's counties. 2. Fairfax County includes the cities of Fairfax and Falls Church 3. Northern Virginia includes the cities of Alexandria, Arlington as well as, Clarke, Fairfax, Fauquier, Loudoun, Prince William, Spotsylvania, Stafford, and Warren counties. 4. The region/Washington Metropolitan Area includes D.C., Suburban Maryland, Northern Virginia, and Jefferson County, WV. Source: CRA			

The CRA forecast of regional employment growth is somewhat larger, but broadly consistent with the most recent forecasts published by the MWCOG. The most recent MWCOG employment forecast estimates an increase of 923,000 jobs between 2010 and 2030 with 167,000 of those new jobs located in Montgomery County.¹⁵ Thus the CRA forecast for growth in Montgomery County is slightly more conservative than the MWCOG forecast.

¹⁵Op. cit., "Growth trends to 2040: Cooperative forecasting in the Washington, D.C. region, Round 8.0"

This forecast of future job growth can be compared to growth over the past 20 years, presented in Exhibit 4. Both in absolute numbers and in the rate of employment growth, the period between 1990 and 2010 saw less change than is projected over the next two decades. Region-wide, almost 600,000 net new jobs were added between 1990 and 2010, an increase of over 26 percent. Thus, the projections in the CRA study for the number of net new jobs are about a 75 percent increase over the job growth of the last 20 years while the rate of increase jumps almost 50 percent (i.e. from 26 percent to 38 percent). Between 1990 and 2010, employment in Montgomery County increased by almost 60,000 jobs, 10 percent of regional job growth. This growth was highly uneven over that 20-year period. Between 1997 and 2000, the county added over 47,000 jobs and then lost over 6,000 jobs in the next decade. Future job growth in Montgomery County is projected to be more than 2.7 times the growth of the past 20 years. In contrast, Fairfax County added over 195,000 jobs from 1990 to 2010 more than the projected gain of 169,000 jobs in that county over the next 20 years. Although the projected job increase for Montgomery and Fairfax counties are nearly equivalent, the change in Fairfax County over the past 20-year period was about three times the change for Montgomery County. The employment projections for the Washington, D.C. region thus represent a substantial increase from historic experience, particularly for Montgomery County.

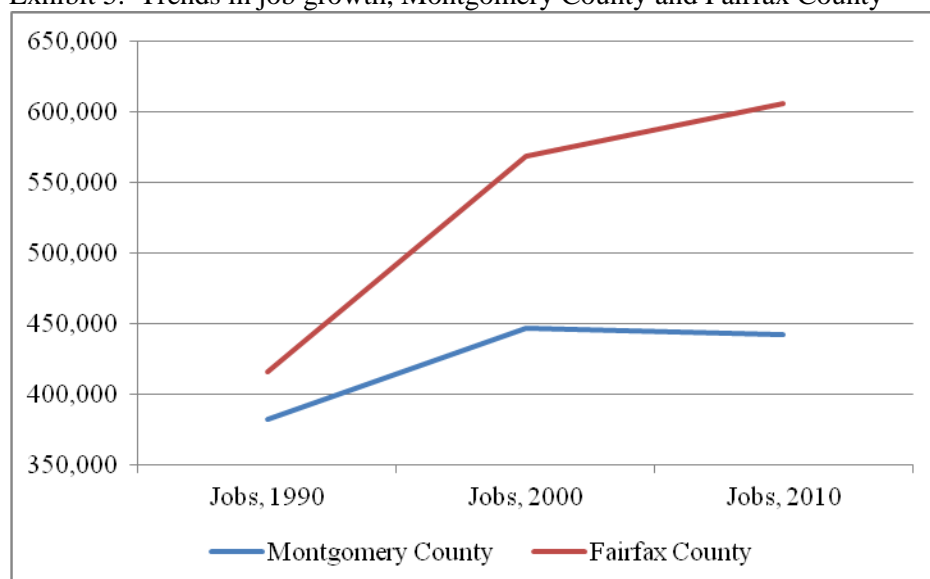
Exhibit 4. Change in jobs, 1990-2010

<i>Jurisdiction (1)</i>	<i>Jobs, 1990</i>	<i>Jobs, 1997</i>	<i>Jobs, 2000</i>	<i>Jobs, 2010</i>	<i>Net new jobs 1990- 2010</i>	<i>Change 1990- 2010</i>	<i>Share of regional job growth</i>
Montgomery County	382,044	398,211	447,208	441,887	59,843	15.7%	10.1%
Suburban Maryland (includes Montgomery County)	758,325	802,401	880,510	894,059	135,734	17.9%	23.0%
Fairfax County	415,538	487,627	569,058	605,823	190,285	45.8%	32.2%
Northern Virginia (includes Fairfax County)	826,743	816,682	1,110,858	1,253,491	426,748	51.6%	72.3%
District of Columbia	669,156	603,786	636,179	693,274	24,118	3.6%	10.1%
Region-wide	2,264,461	2,234,294	2,640,323	2,855,040	590,579	26.1%	100.0%
Note. 1. See Exhibit 3 for descriptions of Washington, D.C. region and sub-areas. Source: Bureau of Labor Statistics							

Montgomery County is often compared to Fairfax County. Both are large, affluent jurisdictions west of Washington, D.C., which have flourished as the Washington, D.C. region has prospered. Recent experience with job growth in the two counties, however, has begun to create significant economic differences between them. In 1990, Montgomery County's 382,000 jobs constituted

17 percent of the region's totals while Fairfax County with 416,000 jobs had 18 percent of the regional total. Over the next 20 years, however, Fairfax County gained 190,000 jobs, an increase of almost 46 percent compared to employment in 1990. Montgomery County added 60,000 jobs, a substantial number, but a rate of increase lower than the regional average. Employment growth in Montgomery County accounted for 10 percent of the region's net new jobs, but Fairfax County claimed almost one-third of these net new jobs. By 2010, Montgomery County accounted for a slightly smaller share of the region's jobs--15 percent--than it had in 1990, while Fairfax County had grown to account for 21 percent of the region's jobs. Exhibit 5 illustrates the different trends and the progressively widening gap over time in employment in the two counties.

Exhibit 5. Trends in job growth, Montgomery County and Fairfax County



Source: Bureau of Labor Statistics

Along with the widening gap between the number of jobs located in the two counties, there has been a widening gap between typical household incomes. In 1999, median household income in Fairfax County was over \$9,000 higher than in Montgomery County. By 2010, the difference in median household incomes in Fairfax and Montgomery counties had grown to almost \$14,000 as incomes grew somewhat faster in Fairfax County than they had in Montgomery County (see Exhibit 6).

Exhibit 6. Median household incomes (current dollars)

	1999	2010	Absolute increase	Percentage change
Montgomery County	\$71,551	\$89,155	\$17,604	25%
Fairfax County	\$81,050	\$103,010	\$21,960	27%
Difference between counties	\$9,499	\$13,855	\$4,356	

Source. U.S. Census

It should be noted that Fairfax and Montgomery counties have been consistently rated as two of the highest income counties in the country, often both counties have ranked in the top 10 large counties ranked by income. Nevertheless, despite their similar status within the Washington, D.C. region, there continues to be a gap between typical incomes in the two counties as Fairfax County has experienced both greater employment growth and somewhat greater income growth than has Montgomery County in the past two decades.

- **Job growth and transit use**

The substantial growth in employment over the past 20 years has coincided with an even larger increase in the use of public transit in Montgomery County and substantial growth in ridership in Fairfax County. Residents' use of public transit in Montgomery County has grown 42 percent in recent years with over 77,000 county residents routinely using public transit in 2010, almost 20,000 more than in 2000 after modest growth in the 1990s.

Public transit use by Montgomery County residents has grown much faster than the county's employment growth. As a result, the ratio of transit riders to county jobs has increased from 14 percent to 18 percent over the past two decades. Growth over time in transit use by Fairfax County residents has closely tracked increases in local employment. Correspondingly, the ratio of transit riders to local jobs in Fairfax County has been relatively stable over time and is considerably lower than the ratio in Montgomery County, as shown in Exhibit 7. These historic trends in transit use presumably reflect job growth, transit availability, and many other factors. Nevertheless, commuting experience in Montgomery County suggests the willingness of a significant share of the county's residents to use public transit.

Exhibit 7. Trends in use of public transit, 1990-2010

<i>Jurisdiction</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>	<i>New riders 1990-2010</i>	<i>Change 1990-2010</i>
• Montgomery County					
Residents using public transit	54,251	57,528	77,112	22,861	42%
Transit users as share of jobs	14%	13%	18%		
• Fairfax County					
Residents using public transit	38,244	38,305	55,274	17,030	45%
Transit users as share of jobs	9%	7%	9%		
Source. U.S. Census					

- **Employment impacts tied to retiring workers**

Net new jobs are only one potential source of demand for development. The demographics of baby boomers, who began to turn 65 in 2011, will continue to generate outsized impacts on the country as a whole and in Montgomery County. By 2030, the youngest baby boomers, born in

1964, will turn 66. The next two decades will then see the retirement of the vast majority of all members of the largest demographic bulge in American history.

Over the 20-year period addressed by the CRA study, a substantial number of existing workers will retire or leave the region. The study estimates that the region will need 1.8 million replacement workers to fill existing jobs vacated because of retirement or other reasons.

The behavior of retirees is of particular interest in considering demands for development. The CRA study notes that an estimated 40 percent of people aged 55 or older move out of state. Thus, a majority of retirees generating the need for replacement workers will choose to remain in their existing homes or will move to other homes in the region. If 60 percent of those 1.8 million currently employed individuals, who will generate the need for future replacement workers, stay in their homes or otherwise stay in the region, then there may be as much demand for new housing for replacement workers as there will be for workers filling net new jobs (1.05 million net new jobs versus 1.08 million retirees staying in the region).¹⁶

For Montgomery County the number of replacement workers needed for the 2010-2030 period is estimated at 200,000, and much of this demand will come sooner rather than later. Over the next decade, the County is expected to need over 147,000 replacement workers.¹⁷ Over the 2010-2030 period, the number of replacement workers needed for existing jobs in Montgomery County might exceed the number of workers for net new jobs by 23 percent (163,008 net new jobs versus 200,000 replacement jobs).

- **Employment, housing demand, and commuting options**

The changing employment picture in Montgomery County will lead directly to pressures for development to accommodate those who will be finding work in the county over the next 20 years. Most people want to live reasonably close to their work. A survey of workers considering moving to Central Maryland from northern New Jersey as a result of BRAC is likely representative of suburban workers in finding that 54 percent wanted to commute no more than 30 minutes.¹⁸

These desires may be difficult to realize given commutes in the Washington, D.C. region or the journeys to work of Montgomery County residents. Average commuting times for county residents are 34 minutes for all commuters and 51 minutes for transit commuters. Nor do commutes all occur within the Washington, D.C. region's individual jurisdictions. A substantial

¹⁶ Ibid.

¹⁷ Communication from Stephen Fuller, CRA, George Mason University to John Duberg, Sage Policy Group, Inc., December 5, 2011. The current estimate of the number of replacement workers needed in Montgomery County from 2011 to 2021 is 147,122.

¹⁸ The survey polled over 2800 individuals working at Fort Monmouth, New Jersey who might relocate to Fort Meade in Central Maryland. Of those definitely considering relocating, 3 percent wanted maximum commutes of less than 10 minutes and 51 percent stated they would consider a maximum commute of 10 - 30 minutes. "Oct 2006 BRAC Survey Results and Analysis"

share of those who work in Montgomery County live outside the county while a similarly large share of the county's residents work outside the county. Nevertheless, any increase in the county's employment base will lead to demands for housing, retail/commercial space, and other development to meet the needs of new workers.

For each jurisdiction in the region, the CRA study calculates a high estimate and low estimate of housing demand solely on the basis of net new jobs. The upper bound is defined as the creation of housing for all net new workers in the jurisdictions in which they work and the assumption that existing jurisdiction-to-jurisdiction commuting volumes hold constant at current levels. In other words, new workers would live and work in the same jurisdiction and current volumes of inter-jurisdiction commuting traffic would not change.

CRA's low estimates of housing demand assume that in-commuting rates for each jurisdiction remain at current rates. That is, if there is an increase in jobs in a given jurisdiction and half of those who currently work in that jurisdiction commute from another jurisdiction, then half of the new workers will also commute from other jurisdictions. Given that over 1 million net new jobs are projected for the Washington, D.C. region over the next 20 years, increasing total employment by 38 percent, the increased load on the region's transportation system will be substantial. For example, CRA's low estimates imply that a half a million new workers will commute to their jobs from homes outside the region, creating unsustainable levels of traffic congestion over the next two decades.

For Montgomery County, the in-commuting rate is currently estimated at 36 percent, the share of workers with jobs in Montgomery County who live outside the county. Thus, the low estimate of housing demand for the county assumes that 36 percent of the 163,008 net new jobs created over the next 20 years will be held by in-commuters. By 2030 the number of commuters from outside the county would increase by 58,683 workers. In the absence of better public transit alternatives, the great majority of these new in-commuters would be driving private vehicles and adding substantially to traffic loads on the transportation system.

These new in-commuters would be adding significantly to County service costs (e.g., for the transportation system or public safety) while contributing little in the way of taxes. The employers of these new workers would contribute additional local and state property and/or state corporate income taxes unless they were nonprofit organizations such as most health care and educational organizations that are exempt from most major taxes. The workers themselves, however, would directly contribute no property taxes or income taxes to Montgomery County government. Indeed, in-commuters would directly add little to County government coffers to offset the increased cost of providing public services.

Exhibit 8 summarizes new housing demand estimates from the CRA study that are associated with the growth in employment in the Washington, D.C. region and CRA's two sets of assumptions for the high and low estimates of demand. For Montgomery County the range is

from almost 70,000 new housing units in the low estimate to over 108,000 housing units in the high estimate, based on approximately 1.5 workers per household.

Exhibit 8. New housing demand from net new employment, 2010-2030

<i>Jurisdiction (1)</i>	<i>High estimate</i>	<i>Annual average</i>	<i>Share of regional growth</i>	<i>Low estimate</i>	<i>Annual average</i>	<i>Share of regional growth</i>
Montgomery County	108,522	5,426	14.8%	69,454	3,473	19.9%
Suburban Maryland (includes Montgomery County)	211,612	10,581	28.9%	133,731	6,687	38.4%
Fairfax County	110,947	5,547	15.2%	52,145	2,607	15.0%
Northern Virginia (includes Fairfax County)	392,817	19,641	53.7%	174,191	8,710	50.0%
District of Columbia	122,613	6,131	16.8%	36,784	1,839	10.6%
Region-wide	731,457	36,573	100.0%	348,282	17,414	100.0%
Note. 1. See Exhibit 3 for description of jurisdictions in the Washington, D.C. region and its sub-regional areas. Source: CRA						

As with the CRA projections of employment, the CRA housing demand estimates can be compared to historic changes in the housing stock. Census data on housing units in the Washington, D.C. region and selected jurisdictions in the past two decades are summarized in Exhibit 9. For the region as a whole, just over 580,000 housing units were added from 1990 to 2010. In comparison, the CRA high estimate is 26 percent greater than the figure reported by the Census Bureau although the CRA low estimate is only 60 percent of the 1990-2010 increase. For Montgomery County, the high estimate of forecasted housing demand is 35 percent larger than the County's historic growth in housing units. The county added just over 80,000 units from 1990 to 2010. These units have been added at a fairly steady rate of about 40,000 units per decade, regardless of changes in county-based employment. On the other hand, the CRA low estimate is 87 percent of the actual housing stock increase from 1990 to 2010. Despite the fact that the Montgomery County housing stock increased 27 percent from 1990 to 2010, this increase in the number of housing units in the county was actually below the regional average increase in the size of the housing stock of 36 percent.

Exhibit 9. Change in housing units, 1990-2010

<i>Jurisdiction</i>	<i>Units, 1990</i>	<i>Units, 2000</i>	<i>Units, 2010</i>	<i>Net new units, 1990- 2010</i>	<i>Change 1990-2010</i>	<i>Share of regional growth</i>
Montgomery County	295,723	334,632	375,905	80,182	27.1%	13.8%
MD (includes Montgomery County)	674,146	781,506	882,966	208,820	31.0%	36.0%
Fairfax County	320,311	372,340	422,167	101,856	31.8%	17.5%
Northern Virginia (includes Fairfax County)	666,130	816,063	1,012,030	345,900	51.9%	59.6%
District of Columbia	278,489	274,845	296,719	18,230	6.5%	3.1%
Region-wide	1,633,371	1,890,037	2,213,752	580,381	35.5%	100.0%

Source: U.S. Census

Yet another perspective on future housing stocks can be seen in the household forecasts that the region's governments have made. Exhibit 10 compares the CRA study's high estimate and the most recent MWCOG forecast of households. For Montgomery County, the MWCOG forecast of households is 31,000 below the CRA high estimate of housing demand. This deficit is 29 percent of the high estimate; a deficit that is somewhat higher than the 24 percent average deficit for the region as a whole. Although the CRA high estimate of housing demand for Fairfax County is above the MWCOG forecast of households, the deficit is much smaller.

Exhibit 10. Employment-driven housing demand versus MWCOG forecast, 2010-2030

<i>Jurisdiction</i>	<i>High estimate</i>	<i>MWCOG forecast</i>	<i>Deficit: absolute</i>	<i>Deficit: percentage</i>
Montgomery County	108,522	77,500	-31,022	-28.6%
Suburban Maryland (includes Montgomery County)	211,612	186,916	-24,696	-11.7%
Fairfax County	110,947	101,869	-9,078	-8.2%
Northern Virginia (includes Fairfax County)	392,817	304,209	-88,608	-22.6%
District of Columbia	122,613	52,045	-70,568	-57.6%
Region-wide	731,457	555,818	-175,639	-24.0%

Sources: CRA, MWCOG

CRA's high estimate of housing demand is based on the assumption that all net new workers will live and work in the same jurisdiction. This is clearly at odds with existing and likely commuting patterns. At the regional level, however, that assumption implies that all net new workers would reside in the region. Region-wide by 2030 then the difference between the CRA high estimate of housing demand and the MWCOG forecast of housing supply suggests that over 175,000 households with over 260,000 workers who are employed at locations in the region will

live outside the region. These workers will need to commute into the region and will place new demands on the regional and extra-regional transportation system.

Over the 2010-2030 period, the MWCOG household forecast for the region equates to 27,800 new housing units per year versus 36,600 units per year for the CRA high estimate. In the past two decades, the region has averaged 28,600 residential building permits per year.¹⁹ The MWCOG forecast for new housing for 2010-2030 is then lower than the CRA high estimate, although not much lower than recent housing creation experience in the Washington, D.C. region. For Montgomery County, the MWCOG forecast of 77,500 units over the next 20 years is not substantially different than the 80,182 housing units that were added from 1990 to 2010.

A final issue related to future housing demand is the need of replacement workers. As noted above, as many as 200,000 workers will need to be replaced in Montgomery County over the next 20 years. If all the current workers who will need to be replaced in the next 20 years left town once they stopped working, then replacement workers might be seen as also replacing the housing demand of these future retirees. In such a case, replacement workers would have no net effect on housing demand in Montgomery County. Yet as the CRA study noted, 60 percent of retirees will likely stay put. Should 60 percent of these 200,000 retirees choose to stay in Montgomery County, then housing for replacement workers associated with these 120,000 retirees will be part of the county's housing demand. As detailed in Exhibit 11, the county's need for replacement workers could create the need for another 80,000 housing units in the County over 20 years. This demand is above and beyond housing demands from net new workers.

Exhibit 11. Housing demand associated with replacement workers, 2010-2030

Number of replacement workers for retirees, others leaving workforce	200,000
Number of retirees, others leaving the area	80,000
Housing demand associated with replacement workers (1)	133,333
Housing vacated by retirees, others leaving area (1)	53,333
Unmet housing demand from replacement workers (1)	80,000
Note. 1. Housing demand assumes 1.5 workers per household.	
Sources. CRA, Sage	

- **Placing bounds on future housing demand**

From these various forecasts of housing demand and households, a range of alternative development scenarios can be compiled. The upper bound can be seen as the housing that would be needed to support the rapidly expanding number of net new jobs located in Montgomery County as well as the housing demand that can arise from replacement workers that will fill many of the jobs that will turnover in the next two decades. The lower bound may be CRA's low estimate, which is premised on no change in current regional commuting patterns.

¹⁹ Ibid., p. 13

Exhibit 12 presents five alternative projections of housing demand for Montgomery County over the 2010-2030 period. Four of the five are explicitly linked to employment in the county, either net new employment or the employment of replacement workers as existing jobholders retire. These projections are intended to illustrate the potential demand for housing. There is no attempt in this analysis to determine whether all of this demand could be met or whether it would arise in the county; this is simply beyond the scope of the resources of this analysis. Indeed, there are a number of obvious arguments that a substantial share of this demand could not be met.

Alternatively, it is highly unlikely that all net new workers and all replacement workers in the county would also reside in the county. An upper bound based on this assumption can be easily challenged. Recent housing development in the county demonstrates that new housing may be developed even as employment declines, however, no attempt has been made to estimate housing demand that is not linked to net new or replacement workers. Clearly there are many components to future housing demand and many uncertainties. Nevertheless, the forecasted surge in employment coupled with the unprecedented changes accompanying the aging and retirement of the baby boomers makes for a remarkable set of potential housing demands.

Exhibit 12. Comparison of projected housing demand to historic change in housing stock

<i>Description of demand</i>	<i>Total demand, 2010-2030</i>	<i>Annual demand</i>	<i>Comparison to 1990-2010 change</i>
High estimate of net new workers and replacement workers	188,522	9,422	235%
Alternative estimate of net new workers and replacement workers	120,583	6,029	150%
High estimate of net new workers	108,522	5,326	133%
MWCOG forecast	77,500	3,875	97%
Low estimate of net new workers	69,454	3,473	87%
Historic change in housing stock, 1990-2010	80,182	4,009	100%
Sources. CRA, MWCOG, Sage			

The five alternatives in Exhibit 12 are defined in terms of housing. Not specified, but implicit in each scenario, is related development of commercial space to accommodate new workplaces, shopping, and other activities. A general description of each alternative follows.

- *High estimate of net new workers and replacement workers.* This alternative combines (1) the CRA high estimate of housing demand from net new workers and (2) the assumption that all county replacement workers would seek housing in the county. The second factor adds demand for 80,000 housing units. The alternative assumes that housing vacated by retiring workers who choose to leave the county is occupied by net new workers and/or replacement workers.

- *Alternative estimate of net new workers and replacement workers.* This alternative combines (1) the CRA low estimate of housing demand from net new workers and (2) the assumption that county replacement workers would seek housing in the county in a pattern similar to the assumptions built into the CRA low estimate. That is, roughly 36 percent of the replacement workers would commute to work from outside the county. The second factor adds demand for 51,129 housing units. The alternative assumes that housing vacated by retiring workers who choose to leave the county would be occupied by net new workers and/or replacement workers.
- *High estimate of net new workers.* This is the CRA high estimate based on the assumption that all net new workers will occupy housing in the county.
- *MWCOG forecast.* This alternative is the last forecast published by the regional council and represents the cooperative perspective of area governments.
- *Low estimate of net new workers.* This is the CRA low estimate that assumes that 36 percent of net new workers in the county will reside elsewhere.
- *Historic change in housing stock, 1990-2010.* This benchmark for future growth is the actual net change in the number of housing units in the county over the 1990-2010 period.

The most obvious response to these scenarios is that three of them identify a demand that is substantially higher than anything the county has ever seen or is currently planning to experience. The CRA high estimate anticipates a growth in housing that exceeds growth rates of the past 20 years by 33 percent. When demands created by replacement workers are included in these scenarios, the forecasted demands grow dramatically, exceeding recent growth rates by 50 percent to 135 percent. Even the lowest projections--the MWCOG forecast and the CRA low estimate--assume that future housing development will be only slightly lower than the growth in the housing stock in the past 20 years.

These forecasts of future housing demand can be added to the current housing stock to calculate what Montgomery County's housing stock would look like in 2030. Exhibit 13 presents these calculations and the increase in the county's total housing stock that would follow from each scenario. If either of the two lowest alternatives were realized, the housing stock would grow by about 20 percent over the next two decades, just under the county's growth rate of the past 20 years. Realizing the housing development associated with either the CRA high estimate or the alternative estimate of demand from net new workers and replacement workers increases the growth rate in the housing stock to the neighborhood of 30 percent. While this is clearly higher than Montgomery County's recent experience, this rate is quite similar to the overall rate of housing stock increase that all suburban Maryland jurisdictions in the Washington, D.C. region and that Fairfax County experienced from 1990 to 2010. The highest forecast would result in an

increase in the county's housing stock of 50 percent. For Montgomery County, this is well outside of historic experience. On the other hand, this increase would be just below the rate of growth that the Virginia suburbs in the Washington, D.C. region experienced in the past two decades. Even the most challenging demands for housing in Montgomery County can find some precedent within the recent experience of the Washington, D.C. region.

Exhibit 13. Projected housing stock, 2030 (1)

<i>Alternative demand scenario</i>	<i>Housing stock, 2030</i>	<i>Increase from housing stock, 2010</i>
High estimate of net new workers and replacement workers	564,427	50.2%
Alternative estimate of net new workers and replacement workers	496,488	32.1%
High estimate of net new workers	484,427	28.9%
MWCOG forecast	453,405	20.6%
Low estimate of net new workers	445,359	18.5%
Historic change in housing stock, 1990-2010	456,087	21.3%
Note. 1. Based on forecasted housing demand shown in Exhibit 9 and 2010 housing stock of 375,905 units. Sources. CRA, MWCOG, Sage		

The housing demands listed in Exhibit 13 can be seen as unconstrained demand for housing. Such projected demand is based on assumptions about where future workers with jobs located in Montgomery County would prefer to live, but does not take into consideration many of the factors that would constrain that demand. As noted the focus of this analysis is the ability of the RTV to enable the county to meet both its forecasted, planned growth and the additional demands for development that can arise from the employment growth that is expected over the next two decades.

It is worth noting that the upper bounds of jobs and housing anticipated in this analysis are well within the bounds studied by the *Comprehensive Growth Policy Study* over 20 years ago. The fast growth alternative for the 1989 study analyzed a county with 900,000 jobs and 600,000 households in 2020. If all the CRA or MWCOG forecasted jobs actually were located in the county by 2030, the employment base would be a bit over 600,000 jobs while the maximum housing demand calculated for this analysis is about 565,000 housing units.

A final comment on future housing demand and other development is to note again that development pressures are not solely created by employment growth. From 2000 to 2010, Montgomery County lost over 5,000 jobs, but gained over 40,000 housing units. The county is a bedroom community as well as an employment center. The County's growth policy acknowledges that unanticipated development occurs. "The Growth Policy has done a reasonable job of coordinating new development... However, the Policy has had no visible

impact on the total amount or pace of growth."²⁰ Market forces, the attractions of the county relative to other jurisdictions, and many other factors will be important. This analysis takes the rather narrow perspective of trying to understand the relationship between the greater mobility provided by the proposed RTV system and the potential for Montgomery County to respond to the demands for housing and other development that are likely to accompany future employment growth and the need for replacement workers.

²⁰ "Reducing our footprint: Planning Board draft, 2009-2011 Growth Policy," Montgomery County Planning Department

4.0 Transit, congestion, and development

The addition of new employment, new housing and other development with their consequent commuting and other travel demands raises the question of the capacity of the existing and future transportation system to accommodate those demands. In particular, the question is how many more cars and other vehicles can be squeezed onto the roadways during peak commuting periods. At some point, congestion becomes unbearable, roadways resemble parking lots, and intersections are gridlocked.

This congestion would effectively block new development. The stranglehold that congestion can have on development and the need for commuting alternatives are explicit in County master plans that will be discussed later.

Where this congestion threshold lies is not especially clear. The low estimate of housing demand by CRA, based on the assumptions that existing commuting patterns will hold constant over the next two decades, is considered to be associated with what that analysis terms "intolerable" levels of congestion.

One clear sign that congestion is a problem now is the recent County planning department decision to stop all future commercial development at the county's Life Science Center until funding for a portion of the Corridor Transitway is allocated. As discussed below, this is the most recent statement of the reliance of County master-planned development on the availability of expanded public transit.²¹

On the other hand, a recent mobility study for Montgomery County indicates that development through the year 2017 consistent with the MWCOG forecast will not materially affect congestion. Primarily because of roadways improvements (particularly the ICC), commuters are expected to experience slightly more congestion, but virtually no change in average travel speeds.²²

The existing commuting behavior for Montgomery County residents (summarized in Exhibit 14) includes the fact that 36 percent of those who work in the county live elsewhere. The most salient characteristic of that behavior is that four of five workers use private vehicles to commute and almost 70 percent drive alone. If the average carpool is two people, then every 100 workers generates about 75 work commutes by private vehicle (70 solo drivers, 5 two-person carpools).

²¹ Jen Bondeson, "Life Sciences' Commercial District: Closed until further notice. Johns Hopkins grabs last space before Rockville-Clarksburg connection is funded," *The Gazette*, Wednesday, November 16, 2011

²² The mobility report projects that by 2017 the County will experience a 7.6 percent increase in households, 18.3 percent increase in employment, and a 3.8 percent increase in lane miles. While vehicle miles and hours traveled both increase (10.7 percent and 11.6 percent, respectively), average speed is projected to decrease by less than 1 percent. See Montgomery County Planning Department, "Mobility assessment report, staff draft," October 2011.

If carpools average more people, then trip generation is lower, but private vehicles still account for over 70 trips for each 100 workers living in the county.

Public transit is a growing part of commuting behavior, currently accounting for one in six work commutes. Almost all transit riders commute by bus or Metrorail. Bus use in Montgomery County has grown substantially in the past decade during which the number of bus users rose by 62 percent, over four times the overall increase in trips to work. Metrorail (i.e. subway, streetcar) ridership has also increased faster than the overall increase in trips to work, but at a rate much lower than the increase in bus usage. Journeys to work are in fact the most common reason to use Metrobus (73 percent of riders) and Metrorail (83 percent of all riders).²³

Exhibit 14. Journey to work, Montgomery County

<i>Means of Transportation</i>	<i>2000 Census</i>			<i>2008-2010 3-Year Estimates</i>			<i>Change</i>	
	Number		Share of total	Number		Share of total	Number	Percent
Car, truck, or van	363,737		85.5%	388,277		80.5%	24,540	6.7%
Drove alone		313,935	73.8%		336,190	69.7%	22,255	7.1%
Carpooled		49,802	11.7%		52,087	10.8%	2,285	4.6%
Public transportation	57,528		13.5%	77,112		16.0%	19,584	34.0%
Bus, trolley bus		18,413	4.3%		29,847	6.2%	11,434	62.1%
Subway, streetcar		36,706	8.6%		44,224	9.2%	7,518	20.5%
Railroad, ferryboat		1,790	0.4%		3,041	0.6%	1,251	69.9%
Taxicab, motorcycle, bicycle, other means	3,943		0.9%	6,200		1.3%	2,257	57.2%
Walked	8,806		2.1%	11,006		2.3%	2,200	25.0%
Total work journeys	425,208		100.0%	482,595		100.0%	57,387	13.5%

Source: U.S. Census

For the county as a whole, this analysis presumes that the point at which the journey to work becomes intolerable for all but the most intrepid is somewhere in the vicinity of the CRA study's low estimate of housing demand and the MWCOG forecast of households through 2030. The CRA study is clear that commuting conditions under the low estimate's assumptions degrade significantly. Because the MWCOG forecast takes into consideration the additions to infrastructure, including all transportation infrastructure, that forecast is by definition capable of implementation. Each forecast anticipates adding housing at a rate somewhat below the rate of the past two decades, in a range between roughly 3,500 housing units (CRA) and 3,900 housing units (MWCOG) per year. This analysis has not had the benefit of transportation modeling that might provide a clearer understanding of the potential for congestion to disrupt future development in the entire county. Consequently, this analysis assumes that the CRA and MWCOG forecasts represent as much development as might occur without a major expansion of transit like the creation of the RTV system.

²³ AECOM, "WMATA regional benefits of transit: Executive summary," WMATA, November, 2011
<http://planitmetro.com/wp-content/uploads/2011/12/WMATA-Regional-Benefits-of-Transit-11.28.2011.pdf>

This assumption helps understand the extent to which some future development in the county would clearly be dependent on the RTV or other significant expansion of public transit. Of course, as noted above, the availability of new public transit capacity is already a necessity before the planned and approved development in the Life Science Center can proceed. Thus, the RTV is a potential enabler and facilitator of development that is already on the books as planned and approved as well as additional development that might occur in response to changes in the employment base of the county over the next two decades.

Given the CRA study's lower estimate that 36 percent of future workers will commute into the county from elsewhere, using the CRA study or the MWCOG forecasts as the development potential without a substantial increase in transit capacity may be optimistic. If current commuting behavior holds over the next 20 years, the 163,008 net new jobs converts to almost 59,000 new workers commuting into the county under the CRA low estimate assumption. If 75 percent of these new workers commute with private vehicles, total employment growth over the next two decades will result in approximately 44,000 new private vehicles added to the county's roadways as new workers journey to work.²⁴

The County planning department's recent mobility report notes that the ICC is a key roadway project that will help maintain commuting conditions through 2017. Even with that new roadway and other added lane miles, the mobility report forecasts that the average ratio of volume to capacity for the county's transportation system will increase from 76 percent to 83 percent.²⁵ Given this increase in utilization with the ICC, the absence of major lane mile additions in the future would likely lead to more substantial utilization of the county's transportation system with the risk that a tipping point for congestion would be reached.

Regardless of the future status of congestion in the county, current conditions are sufficient to help make the Washington, D.C. region the most congested in the nation. The RTV by its nature can increase mobility without relying on the road system. A key question becomes what development--either planned and approved or additional development--in Montgomery County would be enabled by the RTV system?

The most direct method for understanding the development enabled by the RTV is to consider its ridership capacity. The Parsons Brinckerhoff (PB) study of the RTV estimated that ridership, defined as daily boardings, would range from 213,100 to 266,400 persons.²⁶

This may well be conservative as the system analyzed by PB was an early, configuration. More recent studies conducted for the County's Transit Task Force have analyzed more current

²⁴ The in-commuting share of workers is estimated at 36 percent based on Census data. Given the CRA forecast of net new jobs, this converts to 58,683 new in-commuters ($163,008 * 0.36$). At 75 private vehicle commuters per 100 workers, these 58,683 new in-commuters will generate 44,012 new private vehicles added to the commuting mix.

²⁵ Op. cit., Montgomery County Planning Department, "Mobility assessment report, staff draft"

²⁶ Parsons Brinckerhoff, "Countywide Bus Rapid Transit (BRT) Study," April 26, 2011.

configurations and have indicated that route mileage is likely to exceed the initial PB estimates by 11.3 percent.²⁷ The current, revised configuration of the proposed RTV system has significantly greater connectivity to other elements of the transit and transportation system. Sage estimates that this greater connectivity to other modes of transportation is expected to provide an additional boost in ridership over and above the PB estimates. Based on the expanded route mileage of the current RTV-system configuration, Sage estimates that the current configuration of the proposed RTV system would have an estimated ridership ranging from approximately 237,200 to 296,500.

It should be noted that an RTV system is inherently flexible and total capacity is elastic. Routes can be adjusted to become more efficient or effective. The frequency of service can be changed to meet changes in demand. Thus, ridership numbers estimated here are based on current expectations and could be conservative if demand exceeded these expectations.

This ridership estimate would constitute a major expansion in the transit ridership within Montgomery County and can also provide an estimate of the number of journeys to work that would be enabled by the RTV. WMATA's recent study of bus and rail passengers found that the most common reason for using transit was to commute -- 73 percent of bus passengers and 83 percent of Metrorail passengers. These propensities to use transit for commuting provide bounds for estimates of prospective RTV riders who would be commuters.

As listed in Exhibit 15, these factors can provide an estimate of intra-county commuting with the RTV and the housing development potential implied by that commuting behavior. Based on ridership, the RTV could provide work-home trips for at least 89,604 commuters and as many as 132,391 commuters. At 1.5 workers per household, this translates into a range of 59,736 to 88,261 households.

Exhibit 15. RTV ridership and development

<i>RTV ridership factors</i>	<i>Low RTV ridership estimate</i>	<i>High RTV ridership estimate</i>	<i>Midpoint ridership estimate</i>
Daily boardings	237,180	296,503	266,841
Daily round trips (1)	118,590	148,252	133,421
Low estimate work-home trips (2)	86,571	108,224	97,398
High estimate work-home trips (3)	98,430	123,049	110,740
Low estimate households (4)	57,714	72,149	64,932
High estimate households (4)	65,620	82,033	73,827
Notes. 1. Assumes one round trip for every two boardings. 2. Based on 73 percent of passengers being commuters.			

²⁷ Parsons Brinckerhoff, "Countywide Bus Rapid Transit (BRT) Study (Final)", July 2011 & Montgomery County Transit Task Force Master Plan of Highways, November 25, 2011. 11.3 percent figure is derived by comparing the total route length in miles located in Table 3-1 of the PB study (July 2011) with total new construction miles calculated in the MTTTCF report (November 25, 2011) from The mileage numbers exclude ICC miles.

3. Based on 83 percent of passengers being commuters.
 4. Based on 1.5 workers per household.
- Sources. PB, WMATA, CRA, Sage

The capacity of the proposed RTV system would enable tens of thousands of residents to commute to work in Montgomery County without relying on private vehicles and commute without adding to the congestion on the county's roadways. Logically, then the RTV system could enable the development of housing for these commuting households without straining the auto-based transportation system. Such housing would need to be linked to the RTV system in a way that obviated the need to use cars to access transit.

This analysis assumes that the estimated capacity of the RTV system to support commuters within the county directly translates into the capacity to develop housing and associated commercial space in the county. This development in turn can accommodate some share of the projected growth in employment and respond to the likelihood that those working in these new jobs will prefer to live in the county. Housing demand supported by the RTV system ranges from 59,736 to 88,261 units.

The estimates of development that might be possible without major transit improvements and the housing demands that can be supported by an RTV system can be summed and compared to the alternative growth scenarios described earlier in this report. Exhibit 16 makes these comparisons using the lowest and highest combinations of RTV-enabled development and the development potential without major transit changes. As shown, the lowest estimate of RTV-enabled development projects 129,090 housing units over the 2010-2030 period. This is higher than the demand that would occur if net new workers and replacement workers adopted current commuting patterns (i.e. that 36 percent were in-commuters). The highest estimate of RTV-enabled development would project 165,761 new housing units in the county, or 88 percent of the highest estimate of housing demand based on all net new workers and all replacement workers living in the county.

Exhibit 16. Comparison of projected housing demand alternatives and RTV-enabled development potential

<i>Description of demand</i>	<i>Total demand, 2010-2030</i>	<i>Annual demand</i>	<i>Comparison to 1990-2010 change</i>
High estimate of net new workers and replacement workers	188,522	9,422	235%
MWCOG forecast and highest estimate of RTV-enabled development	165,761	8,288	207%
Low estimate of net new workers and lowest estimate of RTV-enabled development	129,190	6,460	161%
Alternative estimate of net new workers and replacement workers	120,583	6,029	150%
High estimate of net new workers	108,522	5,326	133%
MWCOG forecast	77,500	3,875	97%

Low estimate of net new workers	69,454	3,473	87%
Historic change in housing stock, 1990-2010	80,182	4,009	100%
Sources. CRA, MWCOG, PB, WMATA, Sage			

One conclusion of this comparison is that the development that could be enabled by an RTV system is within the bounds of the employment-driven housing demand that is forecast for the County in the CRA study. In other words, RTV has the potential to create alignment between anticipated job creation and associated housing supply. Assuming that future housing development was attuned to the budgets and interests of new workers, there would seem to be more than enough demand to fill the RTV system with commuters.

The growth enabled by an RTV system is more substantial than growth Montgomery County has experienced to date or that the County has forecast for the next 20 years. On the other hand, other jurisdictions in the Washington, D.C. region have experienced these elevated growth rates in the past 20 years. Among the complexities of determining the impacts of an RTV system is the potential for other transit developments that could also contribute to better public transit in Montgomery County. The CCT, however, may become a part of the RTV system, rather than being constructed as a standalone light rail transit system. It is believed that the RTV system (incorporating the CCT) can be the earliest option for creating a transformative increase in transit capacity. Currently, approximately 77,000 county residents routinely rely on public transit (including commuter trains) to get to work. At the lower end of the ridership estimate, the RTV system would easily double this commuting ridership. The highest estimates of ridership and commuter use would boost public transit use 170 percent over current levels. This represents transformative change.

- **Summary of links between transit and development**

By enabling the development of a substantial quantity of housing without relying on the road system for commuting, an RTV system could play a pivotal role in addressing the growth pressures that are predicted to come in the next two decades, both those pressures that are embedded in the official forecasts and reflected in approved master plans and the additional pressures that may well arise from the surge in net new employment. Exhibit 17 summarizes the total demand for housing based on projected changes in employment from 2010 to 2030. Over that period, net new workers and replacement workers will be looking for an estimated 241,855 places to live. After accounting for housing vacated by the estimated 80,000 retirees who will move from the area, there remains a demand for over 188,000 housing units.

Exhibit 17. Total employment related housing demand, 2010 - 2030

Net new workers	163,008
Replacement workers	200,000
Total new workers	363,008
Total housing demand (1)	241,855

Housing vacated by retirees	53,333
Remaining housing demand	188,522
Note. 1. Assumes approximately 1.5 workers per household. Sources. CRA, Sage	

Exhibit 18 recaps how and to what extent that demand for 188,522 housing units might be met in Montgomery County assuming the volumes of housing development discussed above and an RTV system. Two options and a midpoint estimate are presented. The lower capacity option uses the CRA low housing demand estimate and the lowest RTV-enabled housing development alternative; the higher capacity option uses the MWCOG household forecast and the highest RTV-enabled housing development. The CRA low estimate and the MWCOG forecast are assumed to define the maximum housing development possible without the major expansion in transit capacity the RTV system would create. The RTV-enabled housing is defined as the additional housing that could be developed without adding to County roadway congestion.

After these two considerations, there is still substantial housing demand related to those with jobs in the county that is not met by housing in the county -- over 59,000 units for the lower capacity option and almost 23,000 housing units for the higher capacity option. Given the assumption of 1.5 workers per household, this leaves a substantial number of prospective workers with jobs in the county who could not find housing in the county -- almost 89,000 workers for the lower capacity option and over 34,000 workers for the higher capacity option.

In both cases, it is assumed that the transportation system will support almost 59,000 more in-commuters than currently drive into the county to work. This is the number associated with the CRA low housing demand estimate, which is based on maintaining the in-commuting rate of 36 percent for county-based workers. This in-commuting workforce actually exceeds the workers linked to unmet housing demand in the higher capacity option. That is, under the high capacity option, the commuting need by future workers would likely be met without reaching intolerable levels of congestion.

For the lower capacity option, however, over 30,000 workers would remain after county-based housing and the potential for in-commuting are considered. These 30,000 workers are those who would not be able to find a place to live in the county because housing growth had not kept up with employment growth, and could not drive to work in the county because congestion had reached an intolerable level.

Exhibit 18. Summary of met and unmet housing demand, 2010 - 2030

	<i>Lower capacity option</i>	<i>Higher capacity option</i>	<i>Midpoint capacity option</i>
Maximum housing demand	188,522	188,522	188,522
Congestion-limited housing development	69,454	77,500	73,477
Balance of unmet demand (housing units)	119,068	111,022	115,045
RTV-enabled housing development	59,736	88,261	73,998
Balance of unmet demand (housing units)	59,332	22,761	41,047
Workers linked to unmet housing demand	88,998	34,142	61,570
In-commuting workers, maximum possible	58,827	58,827	58,827
Balance of workers	30,171	-24,685	2,743

The implications and consequences of 30,000 workers disconnected from their jobs in the county vary widely. Congestion may not be “intolerable” and auto-based commuters may simply endure longer commutes and the costs in time and fuel (and frustration) longer commutes entail. Others may shift their commuting to public transit assuming there is available capacity in the transit system. Carpooling may increase roadway capacity.

On the other hand, these jobs may move elsewhere. Particularly in the case of net new jobs connected to new businesses, the desirability of locating in Montgomery County may well suffer if traffic congestion and commuting come to be seen as real negatives. If other jurisdictions in the region appear to offer more attractive sites for business, the county could lose these jobs and resulting economic activity to other locations within the region.

Alternatively, some jobs and businesses may leave the region altogether. As jobs and businesses leave the region, housing for these workers will be developed outside the region. People tend to shop where they live (when not shopping online). In an economy driven by consumer spending, shopping creates jobs, particularly retail and service jobs. Thus, as jobs relocate outside the county or the region, there is a compounded economic impact as the multiplier effects of economic activity occur elsewhere.

If housing development lags behind employment growth, housing prices will presumably be higher than if all housing demand could be met within a desirable commuting distance of job locations. The difficulties that such higher prices bring to lower paid workers, often workers in the public sector or the service sector, would continue or be exacerbated.

The midpoint of the low and high capacity options comes close to meeting the presumed housing demand that the county will experience by 2030. In that midpoint case, when the presumed capacity of the transportation system to absorb added in-commuters is exhausted only an estimated 2,743 workers are disconnected from their jobs in the county.

Under the assumptions built into this analysis, an RTV system that can substantially expand the capacity of public transit is crucial to addressing the development pressures that net new and replacement employment will bring to the county. High capacity RTV, coupled with a high propensity to use an RTV system for journeys to work, and the high density development that can best take advantage of more public transit could more than meet these development pressures. Conversely, less new transit capacity, less than keen public interest in using transit, or a failure to integrate new development with mobility that does not depend on private vehicles could create a major disconnect between potential job growth and the ability of workers to fill those jobs because of the lack of available and acceptable ways to commute to work.

As noted above, the ridership estimates used in this assessment do not take into consideration the increased attention paid to interconnections between the RTV system and other transportation options in the revised configuration of the RTV system. This increased integration of the RTV system into the overall transportation system may add a significant boost (estimated at over 20,000 daily boardings or 10,000 daily round trips) to the number of passengers using the RTV system. If these enhanced ridership estimates were realized, then the RTV system would be able to help the County meet even more of the development pressures that are likely to arise over the next 20 years.

5.0 Bottom-up review of transit-enabled development

Master plans for planning districts within Montgomery County provide another perspective on the relationship between transit and development. A review of 10 master plans, commercial market analyses, sectors plans, and similar documents, in varying stages of development, found an almost universal identification of transit as a critical element in overcoming local congestion and in facilitating growth potential by increasing mobility. A number make specific reference to the RTV system and its ability to facilitate the development process.

A handful of these documents have been more fully developed and then approved by the County as guiding documents for development. Four of these fully developed documents address areas along the I-270/MD 355 corridor and have specific measures of planned growth. This corridor encompasses almost half of the county's workforce and is also the site of a substantial portion of the planned residential development. The corridor is also one that is well served by the proposed RTV system with over 23 miles of routes and 29 stations.

These plans--for White Flint, Shady Grove, Great Seneca, and Germantown--are more explicit in the role that transit will play in future growth. All but Germantown have plans to stage development with stipulated criteria that must be met before the next stage of development can be undertaken. The White Flint plan is the clearest in its requirements for transit with its targets for non-auto driven mode share (NADMS) for workers and residents in the area.²⁸ These targets must be met before subsequent stages of the plan can proceed.

Thus the RTV system can be a boon to the development that the County has been planning for and, in some cases, has already approved. An expansion of transit capacity through the development of the RTV system would support current official County policy.

Exhibit 19 summarizes the volume of residential and non-residential development for each plan. Where development is phased, each phase is separately identified. For White Flint and Great Seneca, any specific transit requirements for subsequent development are identified. The White Flint and Germantown plans defined growth in terms of residential housing units, square feet of commercial development, and jobs. Shady Grove and Great Seneca defined growth in terms of housing units and either square feet of commercial development (Great Seneca) or jobs (Shady Grove). For these plans the missing growth measure was estimated using the ratio of

²⁸ NADMS requirements can be met by carpools, walking, taxicabs, and bicycling. As a practical matter, with the possible exception of carpooling, the only practical means of satisfying these requirements is the greater use of public transit. This includes Metrorail, Metrobus, and MARC commuter trains, all of which provide service along the I-270/MD-355 corridor. The proposed RTV system and the CCT, however, are the most readily developed alternative that would provide the kind of quantum increase in transit capacity that these plans require. If the CCT were implemented as a rubber-time system, it would become part of the 140-mile RTV system.

commercial space to jobs in the White Flint plan, just under 300 square feet per job. The exhibit estimates the volume of development in these plans that is dependent on transit. The conclusion is that almost 80,000 jobs, almost 18 million square feet of commercial space and over 32,000 housing units will only be developed if transit is available.

Exhibit 19. Transit-linked development in master plans

<i>Master plan area</i>	<i>Type of development</i>	<i>White Flint</i>	<i>Shady Grove (1)</i>	<i>Great Seneca (2)</i>	<i>Germantown</i>	<i>Total</i>
Year approved		2010	2006	2010	2009	
Existing & approved	Comm. SF	7,290,000	N.A.	10,100,000	11,318,814	25,608,814
	Housing units	4,541	2600	3,300	6,477	16,918
	Jobs	29,500	N.A.	35,920	32,340	85,337
Old master plan	Comm. SF				18,552,310	18,552,310
	Housing units				6,379	6,379
	Jobs				53,000	53,000
Stage 1	Comm. SF	2,000,000	467,712	400,000	5,551,938	12,119,650
	Housing units	3,000	2,540	2,500	10,039	18,079
	Jobs	6,714	1,570	1,343	15,870	37,916
	Transit req. (3)	34%		18%, CCT		
Stage 2	Comm. SF	2,000,000	789,450	2,300,000		5,089,450
	Housing units	3,000	3,540	2,000		8,540
	Jobs	6,714	2,650	7,721		17,084
	Transit req. (3)	42%				
Stage 3	Comm. SF	1,690,000	2,085,340	2,300,000		6,075,340
	Housing units	3,800	6,340	1,200		11,340
	Jobs	5,673	7,000	7,721		20,393
	Transit req. (3)	51%				
Stage 4	Comm. SF			1,800,000		1,800,000
	Housing units			-		-
	Jobs			6,042		6,042
Total development	Comm. SF	12,980,000	N.A.	17,500,000	24,104,248	54,584,248
	Housing units	14,341	15,020	9,000	16,418	54,779
	Jobs	48,600	N.A.	58,743	68,870	176,213
Transit dependent	Comm. SF	3,690,000	3,342,503	6,400,000	5,551,938	17,809,572
	Housing units	6,800	12,420	3,200	10,039	32,459
	Jobs	19,100	11,220	21,484	15,870	67,674
Transit dependent share of total	Comm. SF	28%	N.A.	37%	23%	33%
	Housing units	47%	83%	36%	61%	59%
	Jobs	32%	N.A.	37%	23%	36%

Notes. 1. Shady Grove commercial space estimated at 298 square feet per jobs, based on White Flint sector plan.

2. Great Seneca jobs estimated at 298 square feet per jobs, based on White Flint sector plan.

3. Transit requirement for White Flint is non-auto driver mode share that must be met to proceed to next stage. Great Seneca plan is halted until funding for CCT is approved, but also has a non-auto driver mode share requirement of 18 percent .

Sources. Master plans for respective areas.

For White Flint, the master plan is most explicit about meeting goals for alternatives to drive-alone mobility. When the plan was developed and approved in 2010, the NADMS for the planning area was 26 percent. In other words, 74 percent of mobility was based on people driving by themselves. Before the second stage of development at White Flint can occur, the NADMS must increase to 34 percent; this 8 percentage point increase represents a 31 percent increase in the share of people who are not driving alone. To proceed to the third stage of development, the NADMS must reach 42 percent, an increase of 62 percent over current levels. For commuters, over the past 10 years, the only transportation option to make those kinds of increases has been public transit and especially buses. (see Exhibit 14 for journey to work trends). It is reasonable then to find that an RTV system is the most likely transit option to allow the White Flint plan to advance to the final two stages which encompass 3.7 million square feet of commercial development, 19,100 jobs, and 6,800 housing units. This volume of development accounts for more than one-quarter of the commercial space that is planned for the sector plan area, one-third of the area's jobs, and almost half of the housing units.²⁹

For Shady Grove, the master plan indicates that transit ridership should be supported to reduce traffic congestion. Unlike White Flint, there are no specific NADMS targets, but there are requirements for Traffic Mitigation Agreements if developments within the planning area generate more than 100 additional peak-hour vehicle trips. These agreements require a 50 percent mitigation for residential-related trips and 65 percent for non-residential-related trips. Realistically, any significant development within the Shady Grove planning area would meet the threshold for these mitigation agreements. The only practical way to meet the substantial reductions in trips would be the expanded use of transit. As a consequence, it is assumed that all Shady Grove development--3.3 million square feet of development, 11,220 jobs, and 12,420 housing units are transit dependent.

The Great Seneca plan is the most elaborately staged plan with four stages of development that would increase commercial space from 7 million to 17.5 million square feet, increase jobs from 23,497 to 58,743, and increase housing from 3,300 units to 9,000 units. The "centerpiece" of plan's advancement from stage to stage is the CCT. Construction of the CCT from the Shady Grove Metro to Metropolitan Grove must be fully funded before Stage 2 development can occur.³⁰ Recently, the role of the CCT became even more restrictive as the last approved part of Phase 1 of development within the Great Seneca planning area was approved by the county planning board with the condition that no more such space within Phase 1 will be allowed "until funding for a portion of the Corridor Cities Transitway is allocated."³¹ With this proviso, funded

²⁹ Montgomery County Planning Department, "White Flint sector plan," April 2010.

³⁰ Montgomery County Planning Department, "Great Seneca Science Corridor master plan," June 2010.

³¹ Op. cit, Jen Bondeson.

transit will be the only way for further development to occur in the planning area. The volume of development that is then dependent on transit is 6.4 million square feet of commercial space, 33,127 jobs, and 3,200 housing units, in each case more than one-third of the total development that is expected to occur in the area.

The Germantown plan is the least specific about how transit will enable development. On the other hand, the plan is explicit about clustering the highest density development around the five CCT stations and the one MARC commuter train station and that "[n]ew transit options in the up-County create opportunities for increased housing ... at future transit stations." This plan also clearly differentiated between the volume of development in the previous (1989) master plan and the current (2009) master plan. That increase in development includes 5.6 million square feet of commercial space, almost 16,000 jobs, and just over 10,000 housing units. These transit enabled housing units constitute 61 percent of all the housing units anticipated in the Germantown planning area.

The evidence of these four approved plans clearly indicates that transit is a necessary factor in the future development of the county. Collectively, these four plans encompass almost 80,000 jobs that can be developed only if transit is available. These 80,000 jobs amount to almost half of the 163,008 net new jobs that CRA forecasts for the county. The over 32,000 transit dependent housing units in these plans represent 44 percent to 63 percent of the housing for commuters using the proposed RTV system.

The RTV system, including the CCT segment, is the most plausible source of transit in the time horizons anticipated by these plans. The I-270/MD 355 accounts for about half of current county employment, is the focus for most future growth, and is also a major focus of the RTV system.

A bottom-up perspective on the value of the RTV system is necessarily incomplete. Detailed planning assessments for all districts to be served by the RTV system are not available. Nevertheless, that system appears to be the right fit for meeting the mobility needs of the plans that are well developed and available. While limited, this bottom-up perspective seems to affirm the value and impact of this proposed transit expansion.

6.0 Other measures and metrics related to RTV development

Fortunately for this analysis, WMATA chose to finalize its comprehensive study of the value of Metrorail and Metrobus services in November of this year.³² That study provides a thorough review of the types of benefits that transit can provide. The proposed RTV system should be able to create the same types of benefits for its passengers and for the county as a whole.

WMATA modeled several scenarios to estimate the impacts of Metro service. Each scenario eliminated Metro and all other transit service from the regional transportation and then tested the resulting demands placed on roadways and commuters. In the absence of transit, one scenario examined the expansion of the road system that would be needed to absorb the 925,000 added one-way weekday auto trips and keep travel patterns and travel speeds at current levels. Another scenario looked at the consequent travel time and congestion from adding those travel demands to the current road system (i.e. without expanding the capacity of the road system). Given the nature of these scenarios, the benefits they estimate--savings from less roadway construction and savings from reduced congestion--are mutually exclusive, not additive.

Exhibit 20 summarizes the total daily boardings for Metro and the results of modeling the two scenarios. As shown, Metro service replaces 710 lane miles of roadway with a current value of \$4.7 billion. Commuters avoid 1.2 billion miles of travel which in terms of time and travel cost is valued at \$1.4 billion. Transit use saves 17 fatalities and over 160 moderate or more severe injuries each year as well as 41 million gallons of fuel. The estimated value of reduced emissions from not using that fuel is almost \$10 million from the volatile organic compounds, particulate matter, and carbon dioxide that are not released into the atmosphere. As noted, congestion savings and avoided roadways are mutually exclusive benefits.

These estimates can provide a basis for valuing similar benefits of the proposed RTV system. The critical question in translating the WMATA estimates to the RTV system is making reasonable comparisons of the volume and nature of the services provided by Metro and the RTV system. A comparison of boardings for Metro and the estimated boardings for the RTV system indicates that the RTV system will provide from 18 percent to 23 percent of the volume of service that Metro provides. (See Exhibit 21.) A more difficult question is how the nature of the average Metro trip compares to the average RTV trip. The length of these trips, the types of congestion each would encounter, the nature of routes, and other factors all contribute to the generation of benefits. All of these factors are not well understood for this analysis. As a result, in an effort to be prudent, the assumption is that an RTV trip would create half the benefits of a Metro trip.

³² Op. cit., WMATA

Exhibit 20. Summary of benefits attributable to WMATA's regional transit service

<i>Factor</i>	<i>Unit</i>	<i>Value</i>
Metro total	Boardings/day	1,400,000
Lane miles avoided		710
Lane miles avoided, value	Millions	\$4,700
VMT avoided	Millions	1,216
Value of time	Millions	\$705
Cost of travel	Millions	\$342
Fatalities avoided		17
Critical/severe injuries avoided		15
Serious/moderate avoided		148
Fuel savings	Millions	41
Emission value	Millions	\$9.5
VOC	Tons	260
Particulate matter	Tons	22
CO ₂	Tons	500,000
Source. WMATA		

Exhibit 21. Comparison of Metro and RTV trips per day

<i>Factor</i>	<i>Value</i>	<i>Share of Metro</i>
Metro total	1,400,000	100%
RTV, low estimate	245,491	18%
RTV, high estimate	319,014	23%
Sources. WMATA, PB		

Using the conservative assumption that RTV trips create half the benefits of Metro trips³³ and that the volume of service provided by the proposed RTV system is 18 percent to 23 percent of the current Metro volume of service, low and high estimates of RTV benefits can be calculated. These are summarized in Exhibit 21. The RTV system is estimated to avoid 62 to 81 lane miles valued at \$412 million to \$535 million. For the sake of comparison, the recently opened ICC has 113 lane miles.³⁴ The number of avoided vehicle miles traveled on an annual basis would range from 107 million to 139 million. By avoiding this travel, the value of commuters' time saved ranges from \$62 million to \$80 million while the avoided costs of operating private vehicles, parking, and tolls total another \$30 million to \$39 million. The elimination of more vehicles on the road system would reduce the number of vehicle accidents and save 1.5 to 1.9 lives annually

³³ Functionally, a rider on the RTV system is the equivalent of a Metrorail or Metrobus rider and would generate equivalent benefits to those riders. To err on the side of caution, this analysis chooses to discount the benefits identified by WMATA by 50 percent.

³⁴ "A tale of two states, two tollroads - MD vs. TX, ICC vs. 121 (CORRECTED VERSION)," July 3, 2011 <http://www.tollroadsnews.com/node/5381>

and reduce critical or severe injuries by almost that amount and eliminate 14 to 19 serious or moderate injuries. Fuel savings for commuters would total 3.6 million to 4.7 million gallons of fuel. Because of this reduction in fuel use, emissions of volatile organic compounds (VOC), particulate matter, and CO₂ would be significant and would be valued at \$0.8 million to \$1.1million annually. These and other details are summarized in Exhibit 22. The savings in avoided investment in roadways and the savings from reduced congestion are alternative benefits and mutually exclusive.

Exhibit 22. Estimated value of benefits attributable to RTV system

<i>Factor</i>	<i>Unit</i>	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint estimate</i>
Lane miles avoided		62	81	72
Lane miles avoided, value	Millions	\$412	\$535	\$474
VMT avoided	Millions	107	139	123
Value of time	Millions	\$62	\$80	\$71
Cost of travel	Millions	\$30	\$39	\$34
Fatalities avoided		1.5	1.9	1.7
Critical/severe injuries avoided		1.3	1.7	1.5
Serious/moderate avoided		13	17	15
Fuel savings	Millions of gallons	3.6	4.7	4.1
Emission value	Millions	\$0.8	\$1.1	\$1.0
VOC	Tons	23	30	26
Particulate matter	Tons	1.9	2.5	2.2
CO ₂	Tons	43,838	56,967	50,402
Source. WMATA, PB, Sage				

Another estimate of the value of avoided congestion is derived from the Texas Transportation Institute estimates of the Washington, D.C. regional 2010 congestion costs. As shown in Exhibit 23, the costs of congestion average 74 hours of delay and 37 gallons of fuel annually. Based on the expected average hourly earnings of net new workers and current prices for gasoline, the total annual cost of congestion exceeds \$1,800 per auto commuter.

Exhibit 23. Estimated annual value of avoided congestion per RTV passenger

	<i>Units</i>	<i>Number</i>	<i>Unit value</i>	<i>Total value</i>
Delay/year	Hours	74	\$22.82	\$1,689
Excess fuel consumption/year	Gallons	37	\$3.485	\$129
Total				\$1,818
Sources. TTI, CRA, washingtondcgasprices.com				

Given the projected ridership of the RTV system, this alternative estimate of total annual avoided costs of congestion ranges from \$163 million to \$241 million as shown in Exhibit 24. This range is substantially higher than the range presented in Exhibit 22 based on half the impact of

WMATA. In fact it is roughly double that WMATA-based estimate. The difference is based on implicit assumptions about the nature of RTV-based commutes relative to average auto-based commutes in the Washington, D.C. region. If RTV-based commutes replace typical auto-based commutes in the region, the higher range of values is more accurate. If RTV-based commutes replace shorter, less time consuming commutes, which may be consistent with the intra-county nature of the RTV-based commutes, then the lower range of savings is likely more accurate.

Exhibit 24. Estimated total annual value of avoided congestion for all RTV passengers
(millions of 2010 dollars)

	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint estimate</i>
Annual RTV ridership	89,604	132,391	110,998
Total congestion cost avoided	\$163	\$241	\$202

All of these benefits are in addition to the other economic and fiscal values estimated in this report. Under the assumptions used here, the RTV system would save government major investments in roadways. Alternatively, commuters would save at least \$92 million to as much as \$241 million annually in the value of time and the cost of operating private vehicles to commute. In addition, consumers and others would enjoy over \$1 million annually in environmental benefits. Finally, as noted above, these estimated benefits are based on half of the value of similar benefits created by WMATA. As a result, these estimates of RTV-system benefits should be considered conservative with actual benefits potentially achieving substantially higher values.

Of course, any new residents will also place demands on County services. The comprehensive estimation of these new revenues and demands for services and other fiscal implications of new growth are multifaceted issues that are beyond the scope of this analysis.

7.0 Economic impacts of RTV-enabled development

There are many potential benefits from the increased mobility created by an RTV system. In a region as congested as the Washington, D.C. metropolitan area, the ability to use public transit can save time, reduce personal transportation costs, and increase access to work, housing, entertainment, and other activities. As just noted, the value of these benefits can amount to hundreds of millions of dollars per year.

This analysis takes the view that an RTV system is a public investment that can encourage, facilitate, and enable economic development that would otherwise occur elsewhere. This is entirely consistent with Montgomery County policy and planning. Both in its countywide growth policy and in master plans for specific areas within the county, there is not only a recognition that the solution to congestion and development cannot be more asphalt, but also that specific development potential cannot occur without the creation, expansion, and use of public transit capacity.

From an economic development perspective, public transit is a key element of the infrastructure that enables growth. The availability of this infrastructure is a part of the business climate that attracts jobs and economic activity. In a region as large, dynamic, and economically successful as the Washington, D.C. metropolitan area, infrastructure and business climate help individual jurisdictions compete for economic opportunities that arise on a continuing basis and that are likely to be particularly plentiful over the next two decades. Alternatively, the absence of infrastructure and other support for economic development tends to lead to relative economic stagnation as new development occurs in other areas. In the Washington, D.C. region, the added opportunity cost is that new growth, particularly to meet the need for housing, will occur outside the region altogether. As a result, the economic activity associated with new residents and their spending will also occur outside the region.

- **Key economic impacts**

The economic case for the RTV system is based on the ability of that transit system to enable development that would otherwise not occur. This facilitated development includes both the potential that has been identified in existing master plans--development which is often specifically tied to an expanded public transit capacity--as well as new opportunities for growth that are likely to arise out of the forecasted increase in the employment base. Future additions to the county's population and employment base will place increasing demands on the transportation system. Of particular concern are new private-vehicle-based commuters. At some point, these added vehicles will overwhelm the road system and congestion will reach untenable levels. When this will occur is not well understood. How much congestion will be tolerated is

also difficult to predict. The region is already the nation's most congested and has experienced significant increases in congestion over the past 20 years, but is still anticipating dramatic growth over the next two decades.

Without clearly understanding how future growth will degrade traffic conditions on the county's road system, it is clear that added transit capacity will enable transit riders to get to work with no or minimal reliance on the county's road system. Transit-oriented development is intentionally designed to link housing and workplaces (and other desired destinations).

The economic impacts of this added transit capacity include the possibility of new additions to the county's employment base and to new residents. The expanded employment base will require new commercial development to provide workplaces for the widest possible range of workers from new biotechnology executives to new retail clerks. These new workers create or support a level of economic activity that will support existing and new county businesses. When these new workers also choose to live in the county, growth will expand to new housing ranging from high-rise apartments to traditional single-family homes. These economic impacts can be measured in terms of jobs, income related to those jobs, and the total economic activity that is supported by those jobs.

Public transit also has a documented record of increasing property values near stations and along routes. The ability of public transit to connect workers to jobs, shoppers to consumer goods and services, and people to entertainment among other items represents an impetus to development and increased activity that translates into economic value.

The following discussion focuses on the various economic impacts directly tied to the workers and households that could locate in the county if and only if the proposed RTV system was developed.

The impacts addressed here do not include those associated with the actual construction of the RTV system. Construction represents a major expense, but, as noted earlier, the cost of the proposed RTV system is being developed at the time this report was written. Because there is no well understood capital cost for the RTV system now, this analysis will not be able to address the economic impacts for the County that would flow from building the RTV system.

- **Total economic activity related to net new jobs**

The broadest measure of economic activity in Montgomery County is gross county product (GCP), the total value added by salaries and other compensation, overhead, return on capital, profit, and related multiplier effects. An important concept underlying GCP is the multiplier effect, the consequences of the spending and re-spending of monies in the county economy. For example, when a county resident spends money at a county restaurant, the restaurant in turn will buy some goods and services (e.g., supplies, payroll services) from county-based businesses. These suppliers in turn will use some of these business revenues to purchase other goods and

services from other county-based businesses. The totality of value added through these transactions between county-based businesses is the GCP.

In 2010, each county job supported over \$148,000 in GCP. In real, inflation-adjusted terms, this value is expected to rise by just over 1 percent annually to almost \$196,000 in 2030 (in 2010 dollars). With 1.5 jobs per household, the contribution to the county's economic activity is even higher for each housing unit that is developed to meet the needs of future workers. Exhibit 25 summarizes the average contributions of jobs and households to the county's economy in 2010, 2020, and 2030.³⁵ It is important to note that these contributions are maximized when jobs are held by residents because of the tendencies for people to spend their wages near where they live.

Exhibit 25. Trends for Gross County Product, 2010-2030 (2010 dollars)

<i>Impact</i>	<i>2010</i>	<i>2020</i>	<i>2030</i>
Gross county product per job	\$146,082	\$165,154	\$195,793
Gross county product per household	\$219,123	\$247,731	\$293,689
Sources. IHS Global Insight, CRA			

These economic contributions can be used to illustrate the potential opportunities represented by the net new workers forecast for the county. Exhibit 26 lists the estimated potential economic contribution of all net new workers in 2030. The maximum potential contribution associated with all net new jobs approaches \$32 billion. A substantial share of these net new jobs might be held by county residents who are able to commute by RTV and are thus considered RTV-dependent. The total potential contribution of these RTV-dependent workers in 2030 ranges from \$18 billion to \$26 billion in today's dollars. These contributions are annual values. That is, in 2030, county residents who are able to use the RTV system to commute would support these estimated levels of economic activity. This annual value would be expected to increase modestly each successive year.

Exhibit 26. Potential annual economic contribution of net new workers, 2030
(values in millions of current year dollars)

	<i>Jobs</i>	<i>Total GCP</i>	<i>Share of total</i>
Net new jobs, total	163,008	\$31,916	100%
Net new jobs, RTV-dependent--low	89,604	\$17,544	55%
Net new jobs RTV-dependent--high	132,391	\$25,921	81%
Net new jobs RTV-dependent--midpoint	110,998	\$21,732	68%
Sources. IHS Global Insight, CRA, Sage			

From the broadest economic perspective, the RTV system would facilitate as much as \$26 billion worth of activity in the county in 2030. In the absence of the RTV system or other transit capacity that could enable home-to-work trips without adding to roadway congestion, this economic activity would likely not occur in Montgomery County. It might locate elsewhere in

³⁵ "Economic Case Working Group and Sage Policy Group Report," memorandum from Stephen S. Fuller, Ph.D. to David McDonough, December 17, 2011. Values in 2010 dollars are from IHS Global Insight.

the region or might leave the region altogether. Put another way, the opportunity cost of not developing transit capacity to accommodate new workers and link new housing with workplaces would range from \$18 billion to \$26 billion in Gross County Product.

- **Impacts related to new households**

Each new household that is able to live in the county because of the RTV system has an income and a need for housing. In addition there is a need for commercial space for work, shopping, entertainment, and other activities related to the net new workers and others in these households.

A substantial share of the economic benefits attributable these new households in Montgomery County can be estimated based on the average value of new housing units and the average income of new households. The CRA study provides relevant detail regarding the mix of housing types in Montgomery County and the mix of incomes associated with net new jobs. Given the mix of the net new jobs and the likely composition of new households described in the CRA study, two estimates of income associated with these jobs and households can be made. In the CRA study, the median income for county workers from the Census Bureau's American Community Survey is used to estimate household income. Since median income is the midpoint in the distribution of all incomes for a given job category and usually significantly below the average income, it is sometimes described as the typical income for that category. A second estimate of these incomes can be made based on the Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW), a quarterly count of employment and wages that covers 98 percent of all jobs and is available at the county level. With the exception of self-employment which is a characteristic of some industries and professions (e.g., real estate), QCEW is comprehensive and tends to represent average, rather than median, wages.³⁶

Exhibit 27 summarizes estimated values of income and housing for the households of net new workers who would fill jobs in the county over the next 20 years. These households are almost as likely to rent as to own their housing. Their average annual income is estimated at just over \$71,000 in the CRA study while the average value of housing, either owned or rented, is estimated at almost \$285,000. Using the QCEW wage data, the average household income is estimated at \$93,137 and an associated housing value is estimated at over \$372,000. Lower estimates of income are more appropriate for younger workers and households whereas higher estimates tend to apply to older, more experienced workers. The CRA study's net new workers estimates includes both younger and older households. These estimates of household income are based solely on earnings from employment. Other sources of income (e.g., transfer payments, rents, dividends, capital gains) which can be important for some households are excluded from these estimates.

³⁶ See Appendix for details of calculating household income based on QCEW wage estimates.

Exhibit 27. Income and housing characteristics of net new worker households

	<i>Assumed income</i>	<i>Assumed housing value</i>
Low estimate	\$71,210	\$284,839
High estimate	\$93,137	\$372,549
Midpoint	\$82,174	\$328,694
Sources. CRA, BLS, Sage		

As the CRA study notes, many of these new households are distinctly different than the current county population. Average county household income in 2010 was \$120,201 and two-thirds of housing was owner-occupied. The median owner-occupied housing was valued at \$447,200 while median rent was \$2,498.³⁷ Part of the explanation for these differences is that, relative to existing workers in the county, net new worker households were estimated to be:

- More likely to be single-person and two-person households ;
- Somewhat younger than the existing labor force; and
- Likely to include a more lower-wage earners, often critical to the existence of high-wage earners.

Based on this profile of new households in the county some of the economic impacts associated with projected new residents can be estimated. Exhibit 28 summarizes impacts associated with the lowest and highest estimates of net new worker households, a range of almost 60,000 to over 88,000 households, enabled by the RTV system and provides a midpoint for each factor. With an average household income ranging from over \$71,000 to over \$93,000, the total income of these households is estimated to range from \$4.3 billion to \$8.2 billion. The estimated total value of the housing occupied by these households ranges from \$17 billion to \$33 billion.

Exhibit 28. Economic impacts of net new worker households (millions of 2010 dollars)

<i>Factor</i>	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint</i>
Number of households	59,736	88,261	73,998
Household income	\$4,254	\$8,220	\$6,237
Housing value	\$17,015	\$32,881	\$24,948
Sources. CRA, Maryland Department of Assessment and Taxation, Sage			

Because these new residents are linked to net new jobs in the county, commercial space (e.g., office, lab) will need to be developed. New residents will spend much of their income in the county creating demands for retail and similar commercial development. In fiscal year 2010, the total assessed value of commercial property in the county exceeded \$33 billion or almost

³⁷ U.S. Census Bureau, 2010 American Community Survey 1-Year Estimates, <http://factfinder2.census.gov>.

\$76,000 for each job within the county; personal property (e.g., office furnishings/equipment) totaled another \$4 billion the same year or over \$9,000 per job as listed in Exhibit 29.³⁸

Exhibit 29. Commercial and personal property tax base, 2010

<i>Type of assessment</i>	<i>Total value (millions)</i>	<i>Value per job</i>
Commercial tax base	\$33,575	\$75,981
Personal property base	\$4,102	\$9,283
Sources. CRA, Maryland Department of Assessment and Taxation, Sage		

It is assumed that the commercial development generated by future net new workers who are residents will reflect existing development at least as far as these ratios of value are concerned. Thus, as noted in Exhibit 30, net new workers who are also residents are likely to spur commercial development valued at \$6.8 billion to \$10 billion and an additional investment in personal property valued at \$832 million to \$1.2 billion based on the range of such workers who are RTV-dependent, estimated at 89,604 to 132,391 net new workers.

Exhibit 30. Commercial and personal property development associated with net new RTV-dependent workers residing in Montgomery County, 2030 (millions of 2010 dollars)

<i>Type of assessed property</i>	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint estimate</i>
Commercial property base	\$6,808	\$10,059	\$8,434
Personal property base	\$832	\$1,229	\$1,030
Sources. CRA, Maryland Department of Assessment and Taxation, Sage			

- **Impacts from construction related to net new worker households**

Three major categories of construction will result from the influx of residents and workers that come to the county because of the RTV system. One is the RTV system itself, which will be a major project, but one that cannot be modeled until costs and, particularly, local spending are better understood. The second is the housing that RTV-dependent net new workers will occupy. The final is the commercial space of varying sorts that will be needed to accommodate the new RTV-dependent households and resident workers.

Exhibits 28 and 30, above, summarized the value of the residential and commercial property that would be developed for net new workers who live in the county over the 20-period of interest for this analysis. Over the 2010-2030 period, housing is worth \$17 billion to \$33 billion and commercial property worth \$6.8 billion to \$10 billion would be constructed.

³⁸Maryland State Department of Assessments & Taxation, "Sixty-Sixth Report of the State Department of Assessments and Taxation," January 2010 http://www.dat.state.md.us/sdatweb/stats/AnnualRpt_2010.pdf

The total economic activity associated with this volume of construction is summarized in Exhibit 31.

Over the 20-year period from 2010 to 2030, construction activities would support from 303,000 to 546,000 years of work for the construction industry, its suppliers, and consumer oriented businesses in Montgomery County. Income for county workers associated with this work would range from \$16 billion to \$29 billion and business sales are estimated to range from \$37 billion to \$68 billion. State impacts (which include county impacts) are higher. These are total impacts which include direct impacts of the construction industry, the indirect impacts related to the supply chain for the construction industry, and the induced impacts generated when construction industry workers and workers in the supply chain spend their wages in the local economy.

Exhibit 31. Total economic impacts of construction activities, 2010-2030, total impacts

<i>Factor</i>	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint</i>
• Montgomery County			
Jobs (years of full- and part-time work)	302,885	545,934	424,410
Income (millions of dollars)	\$16,216	\$29,228	\$22,722
Business sales (millions of dollars)	\$37,455	\$67,511	\$52,483
• Maryland			
Jobs (years of full- and part-time work)	358,965	647,017	502,991
Income (millions of dollars)	\$18,650	\$33,616	\$26,133
Business sales (millions of dollars)	\$44,563	\$80,323	\$62,443
Sources. CRA, Maryland Department of Assessment and Taxation, Sage			

Some of these construction impacts are included in the previously discussed economic impacts of future county households created by net new workers. From 2010 to 2030 construction employment in the county is expected to increase by 95 percent from 24,806 workers to 48,443 workers if all 163,008 jobs forecasted by the CRA study for the county are created. Thus some of the construction activities summarized in Exhibit 31 would be undertaken by net new workers. Some of these net new workers would be classified as RTV-dependent workers and their portion of the total construction activities summarized in Exhibit 31 would be a double-count of their economic activities previously discussed.

The bulk of these construction impacts, however, are linked to the employment base of construction workers in 2010 and new construction workers whose jobs are not RTV-dependent. Exhibit 32 presents the trends in construction employment in the county from 2010 to 2030 and how those trends are likely to affect construction employment in 2030. The high estimate is based on the presumption that all forecasted jobs for the county would be created because the high estimate of RTV-dependent workers and households enables all forecasted employment (see Exhibit 16). The low estimate in Exhibit 32 assumes that the lower bound of RTV-

dependent workers and households (see low estimate in Exhibit 17) will reduce the number of jobs that can be created in the county by over 30,000 jobs. On a prorated basis, over 4,000 of these jobs are likely to be construction jobs. Exhibit 31 makes the further assumption that construction workers are as likely to be RTV-dependent as other future workers in the county.

Based on these estimates and assumptions, Exhibit 32 estimates that construction worker employment in 2030 will be a mix of jobs that existed in 2010, jobs held by RTV-dependent net new workers, and other net new workers. RTV-dependent workers constitute an estimated 29 percent to 40 percent of all construction workers in the county in 2030. Because RTV-dependent workers did not exist in 2010, RTV-dependent workers would constitute on average 15 percent to 20 percent of all construction workers in the county over the 2010-2030 period. The potential double-count for the construction impacts is presented in Exhibit 31. As a result the share of total construction impacts that are tied to non-RTV-dependent construction workers is estimated to range from 80 percent to 85 percent.

Exhibit 32. Composition of construction worker employment, 2030

<i>Components of 2030 construction employment base</i>	<i>No. of construction workers</i>		<i>Share of 2030 construction workforce</i>	
	Low	High	Low	High
2010 construction employment base	24,806	24,806	56%	51%
RTV-dependent net new construction workers, 2030	12,993	19,197	29%	40%
Other net new construction workers in 2030	6,269	4,440	14%	9%
2030 construction employment base	44,068	48,443	100%	100%
Average share, RTV-dependent construction workers, 2010-2030			15%	20%
Average share, all other construction workers, 2010-2030			85%	80%

Exhibit 33 presents the previous estimated construction impacts adjusted for the potential double-count of impacts related to RTV-dependent workers. These are total impacts that include indirect and induced effects and are also one-time, temporary effects that endure so long as construction endures. As shown, the impacts for the county range from over 258,000 to almost 438,000 years of construction and related work with associated income ranging from almost \$14 billion to over \$23 billion. Business sales of goods and services for county establishments are estimated to range from almost \$32 billion to over \$54 billion. All values are presented in 2010 dollars.

Exhibit 33. Adjusted economic impacts of construction activities, 2010-2030, total one-time impacts (values in millions of 2010 dollars)

<i>Factor</i>	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint</i>
• Montgomery County			
Jobs (years of full- and part-time work)	258,233	437,761	347,997
Income (millions of dollars)	\$13,825	\$23,436	\$18,631
Business sales (millions of dollars)	\$31,933	\$54,134	\$43,034
• Maryland			
Jobs (years of full- and part-time work)	306,046	518,814	412,430
Income (millions of dollars)	\$15,901	\$26,955	\$21,428
Business sales (millions of dollars)	\$37,994	\$64,408	\$51,201
Sources. CRA, Maryland Department of Assessment and Taxation, Sage			

• **Impact of an RTV system on nearby property**

In addition to fostering or enabling development of new housing and new commercial space, an RTV system may also increase the value of existing property that is proximate to stations and the RTV routes. The underlying logic is that increased activity and accessibility add value to commercial and residential properties.

A number of studies in the Washington area and elsewhere have established an incremental boost in existing property values or economic activity that is near transit stations and lines. The bulk of these studies have addressed rail or streetcar systems, however, a number of studies of bus rapid transit (BRT) systems in this country and abroad have also looked at benefits for nearby properties.

A study of returns on investment for transit alternatives in the District of Columbia compared streetcars to BRT. One category of return on investment was based on increased business activity along the proposed routes. The analysis assumed that BRT would increase such activity by 10 percent and assumed that a streetcar would increase activity by 25 percent. The variance between these estimated impacts reflects a common view in the transportation community that fixed rail systems are considered a more certain generator of activity than are more flexible transit systems such as BRTs.³⁹

An analysis of a BRT system in operation in Pittsburgh since 1983 was able to document increases in property values near system stations. Using parcel level data, the analysis found that moving from 101 feet to 100 feet away from a station (1 foot closer) increases property value per

³⁹ "District of Columbia Transit Improvements Alternatives Analysis: Return on Investment Report," District of Columbia Department of Transportation, Washington Metropolitan Area Transit Authority, May 2005.

square foot approximately \$19.00 while moving from 1,001 to 1,000 feet away from a station increases property value by approximately \$2.70.⁴⁰

The Washington Metropolitan Area Transit Authority (WMATA) recently completed an analysis of the value of Metro services. Included in this analysis is a parcel-level assessment of the impact on property values of proximity to Metrorail, based on a very large and proprietary dataset of parcel values. The WMATA study concluded that Metrorail increased property values from roughly 7 percent (for residential properties) to 9 percent (for multifamily and commercial office space) within one-half mile of a rail station. These are systemwide averages encompassing both examples of exceptional value enhancement and examples where Metrorail has had little or no effect. Across the region served by Metrorail, this added property value results in \$224 million in additional property tax revenue from properties within one-half mile of stations with a majority of this added tax revenue (\$133 million) derived from properties within one-quarter mile of stations.⁴¹

Given the common finding or assumption that fixed rail systems have greater impacts than RTV or BRT systems, it is assumed that any impacts from Metrorail would represent an upper bound on the potential impacts of an RTV system.⁴² For this analysis it is assumed that an RTV system in Montgomery County would at a minimum have at least 10 percent of the impact of Metrorail. That is, the range of RTV-system impacts would be 10 percent to 100 percent of the WMATA impacts.

These impacts would increase the value of existing property within close proximity of RTV-system stations and routes. These incremental increases in property value are independent of, separate from, and in addition to new construction that would be undertaken as a result of the RTV system. Another Transit Task Force work group has compiled current property values of individual parcels within 0.25 mile and 0.5 mile of the centerline of proposed RTV routes. Exhibit 34 lists these existing property values.

Exhibit 34. County property values along RTV proposed routes
(millions of 2010 dollars)

<i>Distance from route</i>	<i>Value of property</i>
Within 0.25 mile	\$40,355
Within 0.5 mile	\$63,243
Within 0.25-0.5 mile	\$22,888
Source. Montgomery County Transit Task Force	

⁴⁰ Victoria Perk and Cheryl Thole, " Land Use Impacts of BRT: Bus Rapid Transit and Transit Oriented Development, National Transit Institute Webinar," Center for Urban Transportation Research, University of South Florida, March 23, 2010

⁴¹ Op. cit., AECOM.

⁴² Conference call with Nat Bottigheimer, WMATA, other WMATA staff, David McDonough, and Sage Policy staff, October 21, 2011.

The potential of the RTV system to increase the value of this existing property is summarized in Exhibit 35. The upper end of the impact range (9 percent) is applied to the parcels that are within 0.25 mile of the centerline of the RTV routes while the lower end of the impact range is applied to parcels that lie from 0.25 mile to 0.5 mile of the RTV route centerlines. As shown, the total increase in property values ranges from \$523 million to \$5.2 billion. These estimates are incremental increases in the value of existing property values attributable to the presence of the RTV system. These values are in addition to the value of new housing and commercial properties that would be created to meet the needs of net new workers who would also be residents of the county (see Exhibits 31 and 33, above).

Exhibit 35. Impact of RTV on nearby property values (millions of 2010 dollars)

<i>Distance from route</i>	<i>Existing value</i>	<i>Increase in value from existing value</i>				
		Low	High	Low	High	Midpoint
0.25 mile	\$40,355	0.9%	9.0%	\$363	\$3,632	\$1,998
0.25-0.5 mile	\$22,888	0.7%	7.0%	\$160	\$1,602	\$881
Total	\$63,243			\$523	\$5,234	\$2,879

Source. Montgomery County Transit Task Force, WMATA, Sage

- **Impact of net new workers who are in-commuters**

In this analysis not all net new workers are assumed to be residents of the county. If it is assumed that replacement workers are first in line for housing in the county, the number of net new workers who do not reside in the county ranges from approximately 34,000 to 59,000. This estimate takes into account the total potential net new workers who would not be able to find housing in the county and the ability of the net new workers to commute from outside the county. In the low RTV-ridership estimate almost 89,000 potential net new workers would not be able to find housing in the county whereas in the high RTV-ridership estimate, only 34,000 net new workers would not be able to find housing in the county. These net new workers would then be prospective new in-commuters. The capacity of the transportation system to accommodate net new in-commuters, however, is assumed to be a maximum of approximately 59,000 workers. Under the low RTV-ridership estimate, over 30,000 potential net new workers could not get to work because the transportation system would be too congested. Under the high-RTV estimate, the transportation system can more than accommodate these new in-commuters. See Exhibit 36.

Exhibit 36. Estimated non-resident net new workers

	<i>Low RTV ridership estimate</i>	<i>High RTV ridership estimate</i>	<i>Midpoint RTV ridership estimate</i>
Net new workers linked to unmet housing demand	88,998	34,142	61,570
In-commuting workers, maximum possible	58,827	58,827	58,827
Balance of workers	30,171	-24,685	2,743

Sources. CRA, Sage

Non-resident net new workers will create economic benefits for the county. New commercial development will be triggered by their employment. As noted above, the amount is approximately \$76,000 worth of commercial property and \$9,000 of personal property for each worker (see Exhibit 29). None of this development, however, is linked directly to the RTV system. Consequently, these impacts are not considered economic consequences of the RTV system; and this analysis does not credit these impacts to the RTV system.

- **Summary of economic impacts**

Exhibit 37 summarizes the economic impacts that are dependent upon the proposed RTV system and that are tied to the new workers and households able to live in the county in 2030 because of this expanded transit capacity. These impacts reflect the impacts associated with a fully built RTV system. The midpoint estimate is that almost 111,000 jobs are RTV-dependent. These jobs are associated with more than \$21 billion in gross county product. They are also associated with almost 74,000 new county households with total income of \$6.2 billion (in 2010 dollars) and total housing values of \$25 billion (in 2010 dollars). New investments in commercial and personal property associated with these net new workers are estimated at \$8.4 billion and \$1 billion, respectively. All of these impacts can be considered permanent conditions -- additions to the county's employment base, housing stock, and so on--that provide ongoing economic benefits.

Exhibit 37. Economic impacts of RTV-dependent, net new workers and households, 2030
(values in millions of 2010 dollars)

<i>Factor</i>	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint estimate</i>
Net new jobs	89,604	132,391	110,998
Gross county product	\$17,544	\$25,921	\$21,732
Number of households	59,736	88,261	73,998
Household income	\$4,254	\$8,220	\$6,237
Housing value	\$17,015	\$32,881	\$24,948
Commercial property value	\$6,808	\$10,059	\$8,434
Personal property value	\$832	\$1,229	\$1,030

Sources. CRA, Maryland Department of Assessment and Taxation, Sage

After accounting for the construction activities included in the values listed in Exhibit 37, the construction activities associated with the investments in housing and commercial property occasioned by these net new workers living in the county provide another set of economic impacts. Construction impacts are by their nature temporary, created during the construction period only.

As noted in Exhibit 38, adjusted economic impacts of these construction activities are substantial. The midpoint estimate is 347,000 years of work in the county with associated income of over \$18 billion and business sales exceeding \$43 billion.

Exhibit 38. Adjusted economic impacts of construction activities, 2010-2030, total one-time impacts (millions of 2010 dollars)

<i>Factor</i>	<i>Low estimate</i>	<i>High estimate</i>	<i>Midpoint</i>
• Montgomery County			
Jobs (years of full- and part-time work)	258,233	437,761	347,997
Income (millions of dollars)	\$13,825	\$23,436	\$18,631
Business sales (millions of dollars)	\$31,933	\$54,134	\$43,034
• Maryland			
Jobs (years of full- and part-time work)	306,046	518,814	412,430
Income (millions of dollars)	\$15,901	\$26,955	\$21,428
Business sales (millions of dollars)	\$37,994	\$64,408	\$51,201
Sources. CRA, Maryland Department of Assessment and Taxation, Sage			

Finally, the creation of the RTV system will increase the value of property lying near the proposed RTV routes and stations. Increased activity and pedestrian traffic will increase the value of these properties by \$2.9 billion (midpoint estimate).

Exhibit 39. Impact of RTV on nearby property values (millions of 2010 dollars)

<i>Distance from route</i>	<i>Existing value</i>	<i>Increase in value from existing value</i>				
		<i>Low</i>	<i>High</i>	<i>Low</i>	<i>High</i>	<i>Midpoint</i>
0.25 mile	\$40,355	0.9%	9.0%	\$363	\$3,632	\$1,998
0.25-0.5 mile	\$22,888	0.7%	7.0%	\$160	\$1,602	\$881
Total	\$63,243			\$523	\$5,234	\$2,879

- Fiscal impacts

The increase in net new workers will result in new revenues for County government as well as new demands for County government services. The ultimate impact of these workers and the RTV-system on the County's fiscal status is complicated by the presumptions that new development, new workers, and new households will be not reflect the current population. More intense development and younger, smaller households are likely to create distinct impacts. These impacts will also occur in the context of a substantial turnover in existing workers over the next 20 years and the transition of a substantial share of the county's population from workers to retirees. A thorough and comprehensive understanding of fiscal consequences of these dynamics is beyond the scope and resources of this analysis.

8.0 Conclusions, other issues and questions

The Washington, D.C. region is expected to see overall employment grow by 1 million or more jobs in the next 20 years. As one of the largest and most affluent jurisdictions in the region, Montgomery County is expected to be the location of over 160,000 of those net new jobs. This forecast for the county, made a year ago by MWCOG and confirmed recently by CRA, will be a remarkable change after the loss of more than 5,000 jobs in the last decade.

This increase in net new jobs will also coincide with the retirement of the baby boomers. As a result, replacement workers for 200,000 jobs in the county will be needed at the same time that total county employment may grow by over 160,000 jobs if not constrained by congestion, infrastructure limitations, and other factors.

With most retirees staying in the area, new jobs and replacement workers will create substantial pressures for development in the county. Many people will want to live in the county to be near work. New commercial space for workers, shoppers, and others will add more demands in addition to the need for new housing.

Congestion in the region and the county, already the worst in the country, will be a major problem given all this growth. Fortunately, the County has a clear understanding that transit and development that takes advantage of transit are key the County's future.

When congestion would overcome the county's road system is somewhat unclear. What is clear is that the absence of expanded transit would lead to major congestion problems. This congestion in turn would act as a major brake on growth with consequent losses of jobs, housing, commercial space, and associated tax revenues which would move elsewhere in the region or out of the region. More fundamentally, the absence of growth would mean the loss of new households, almost certainly younger. The demographic implications of non-growth are likely profound.

With its ability to connect new residents to work, the proposed RTV system would create major economic and fiscal impacts for the county. Construction activities resulting from these new residents and workers and impact fees levied on new development, however, would create additional and massive one-time economic and fiscal impacts. Over the next 20 years, total tax revenues would exceed costs of services.

Beyond these impacts linked to new residents and new development, the RTV system generates another substantial set of benefits by taking private vehicles off the road system. These benefits accrue to the County, its residents, and others in the region.

This analysis has been undertaken in a relatively short period of time. As a result it has relied on existing work to understand the nature of the RTV system, the pressures for growth over the next 20 years, the ability of the RTV system to help the County manage that growth, and other key issues. Necessarily, a number of assumptions have been made that may be questionable.

Nevertheless, the conclusions that the RTV system would be an effective and beneficial response to the transportation demands of forecasted growth are supported by the existing body of literature.

- The CRA forecast of county growth potential, while a remarkable departure from the recent past, is entirely consistent with MWCOG forecasts which represent the collective views of local government officials.
- The *Comprehensive Growth Policy Study* released in 1989 using modeling results unavailable for this analysis came to similar conclusions about the value of transit and actually found that a smaller transit system than the proposed RTV system could support more growth than is contemplated for the next 20 years. That study also found that reliance on private vehicles, even with a major campaign for carpooling, would not support the kind of growth the county is likely to experience in the next 20 years.
- WMATA's study of Metro services is a very timely assessment of the economic and fiscal benefits of transit that should also apply to the RTV system. That study also identifies a range of other benefits for transit that will be equally applicable to new transit in the county.
- The future for the county that is implicit in this analysis--more transit, more intense development--is entirely consistent with the master plans, growth policy, and other official documents generated by County government.

Although there is sufficient support for the general findings and conclusions of this analysis, there are also plenty of open questions and issues worthy of further study.

- The most difficult technical question to address concerned future congestion and the point at which congestion becomes intolerable. The best approach to this question is presumably modeling various scenarios of future growth. The assumption that 70,000 to almost 80,000 more housing units can be added to the county's housing stock without traffic grinding to a halt is certainly open to question. The fact that congestion is forecasted to be no worse in 2017 than it is now may be based largely on the ICC. Even with that new capacity, volume to capacity rises from 76 percent to 83 percent. What would that ratio be in another 7 or 13 years without the addition of another ICC and no major boost in transit capacity?

- Perhaps the most difficult policy question that was not addressed by this analysis is the county's willingness to grow. The forecast of jobs and development could create a substantially different county. It has been assumed that there is sufficient capacity and will to allow this growth.
- This analysis of future costs of service is at best a first round estimate. Denser development should lead to less costly service delivery to new development. Similarly, any changes in local property tax and other local income tax rates would also affect the results presented here.
- The capacity of the RTV system may be larger than what is assumed in this analysis. The largest uncertainties are probably associated with the synergistic effects of the RTV connections with other transportation systems and the ability of the RTV system to provide routes which match the needs to prospective riders.
- The construction and operation of the RTV system itself would create a series of economic and fiscal impacts.

As a final point, the study team was asked to address whether such a system should be built-out over the course of a few years or over the course of two or three decades. This is very difficult to assess given the absence of estimates of construction expense, including those at the level of the individual station. While the construction of the RTV system will likely be phased and will likely first target what are felt to be high impact opportunities, this analysis is largely focused upon the economics of a fully developed system.

Appendix

- Incomes of net new workers

One method for estimating the income of net new workers in Montgomery County over the 2010-2030 period is to assign earnings to forecasted jobs on the basis of QCEW data. Exhibit A1 uses the distribution of net new workers in the CRA study and QCEW wages for those jobs or industries for 2010. QCEW does not collect data on military workers. The CRA value for military wages was used instead. At 1.5 workers per household, weighted average household income is over \$93,000.

Exhibit A1. Estimation of income of net new workers and households

<i>Industry/occupation</i>	<i>Net new workers</i>	<i>Share of total</i>	<i>CQEW wages</i>
Total Employment	163,008	100.0%	
Construction, Natural Resources and Mining	23,637	14.5%	\$58,284
Manufacturing	-1,502	-0.9%	\$99,418
Transportation & Utilities	1,265	0.8%	\$54,637
Wholesale Trade	1,990	1.2%	\$94,449
Retail Trade	8,256	5.1%	\$31,264
Information	3,197	2.0%	\$96,681
Finance and Insurance	2,549	1.6%	\$90,288
Real Estate and Rental and Leasing	2,900	1.8%	\$69,822
Prof, scientific and technical services; management	42,540	26.1%	\$92,164
Admin and waste services	16,708	10.2%	\$38,831
Education	6,579	4.0%	\$40,771
Health Services	27,160	16.7%	\$50,135
Leisure and Hospitality	9,670	5.9%	\$20,887
Other Services	5,107	3.1%	\$38,732
Government/Public Administration	10,302	6.3%	\$82,143
Military	2,650	1.6%	\$72,000
Weighted average income/job			\$62,091
Weighted average income/household at 1.5 jobs/household			\$93,137
Sources. CRA, BLS, Sage			

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